The Chemical Age

A Weekly Journal Devoted to Industrial and Engineering Chemistry

VOL. XL. April 1, 1939 No. 1,031

The Productivity of Industry

PROBLEMS of man-power have been forced upon the attention of industry by recent events. National economics in some countries seem to be topsy-turvy, but ultimately must be governed by these principles upon which our modern capitalistic system has been based. If a country can be completely independent of foreign imports, it can be prosperous without foreign trade. The creation of wealth consists in the conversion of values from the lower levels represented by raw materials to the higher levels represented by finished products. A completely self-contained nation, therefore, only needs money as a form of simple book-keeping; in place of entries in books the individual receives counters which he can save against need, or give away in return for goods. In the long run, it appears that the wealth of a nation so organised depends upon the rate at which it can convert goods from the lower-value levels to the higher-value levels.

A memorandum recently published by the London and Cambridge Economic Service on output, employment and wages in the United Kingdom, shows upon analysis that within recent years, especially since 1924, while the value in terms of money of the output of the country may not have changed greatly per operative employed, the quantity of goods produced has increased enormously. The productivity of an industry can increase even though the number of employees decreases, a fact which is at the bottom of our unemployment problem, just as the increase in technical efficiency of industrial furnaces has been the root of the fall in output of the coal industry. Increasing efficiency, and increasing productivity are bringing with them problems that we hardly yet seem to be on the way to solve. Mr. J. M. Keynes, the eminent chemist, has analysed the figures given in the memorandum and finds that when account has been taken of price changes since 1924, during the following 11 years the productivity of employees in factories and mines rose by 25 per cent., in public utility services by 27 per cent., and in agriculture by 40 per cent. It is doubtful how far many people have been aware of the increase in this country's productivity—an increase which is profoundly impressive, even if the fact be taken into account that many industries were probably working at lower rated outputs in 1924 than in 1935.

It becomes evident that we have been able to absorb this greater output because the price was reduced; the figures given in the report show that the monetary value of the net factory output was constant between 1924 and 1930, and rose by 7 per cent. between 1930 and 1935. We have, as Mr. Keynes remarks, reason to be satisfied except in our failure to expand incomes as a whole to keep pace with our new potentialities of production. Incomes, however, are in exporting countries governed partly by the standard of living in other countries, so that in the long run, and in the present world organisation, it seems as though the only permissible result of higher productivity must be to decrease prices, and thus to stimulate production and consumption without increasing the monetary spending power. This, however, has one advantage in that it is increasing the availability of goods and is thus raising the standard of living without raising wages. In that way we can live on a higher and more comfortable plane without losing our competitive power in the world's markets. The five-day week which, as our correspondence columns show, is growing in popularity, appears to be one very excellent way of enjoying the results of higher productivity per man.

The use of automatic control of industrial plants is one direction in which we are increasing productivity per man. The cost of recovering benzole or of making concentrated ammonia liquor, for example, were formerly such as made it impossible to conduct either of these processes except on a large scale, because of the constant personal attention required. Of recent years, fully automatic plants have been developed which have enabled labour to be virtually dispensed with, and these processes can now be installed in all but the smallest works. In this way, not only has productivity per man been increased, but also the total quantity of the commodities available. The increase in technical efficiency has brought with it special problems in displacement. Labour that has been trained to operate particular industries is being displaced, and this can only be avoided if production increase is paralleled by consumption. So long as increased production is accompanied by decrease in price, this may happen; otherwise we shall only worsen our employment problem. This is another way of saying that marketing and its problems are equally as important as production, and that the study of scientific marketing in all industries should be raised to the same plane as the study of technical processes.

Regarded in the widest sense, chemical manufacture is emphatically a key industry and the most basic of all the productive trades. Chemical materials are essential to every calling, including agriculture, the most fundamental of all.

—*Sir Gilbert T. Morgan.*

NOTES AND COMMENTS

I.C.I. Results for 1938

THE products of Imperial Chemical Industries, Ltd., find outlets in so many different industries and the interests of the company are so widespread, that one would expect its prosperity to be largely dependent upon that of British industry as a whole. That this is not an entirely true supposition is shown by the preliminary figures and dividend for the past year as published in our issue of last week. The drop in net income from £7,510,707 for 1937 to £7,061,291 for 1938 is not great when viewed in the true light of percentage drop and is in fact very creditably small when it is remembered that 1937 was a year of exceptional activity and profit for the company. Last year's net income is greater than that in 1935, and only slightly smaller than in 1936. The small reduction in dividend of ½ per cent. is to be expected from results which, though not so good as last year, are certainly better than those of the majority of industrial concerns during the general trade recession in 1938. Lord McGowan's speech at the company's annual general meeting on May 11 should be especially interesting this year, when times are notoriously difficult, as a guide to the position of trade and its prospects.

The New Civil Defence Bill

THE new Civil Defence Bill which was published last Friday contains 75 clauses and 2 schedules and one part of the Bill deals with the provision for persons working in industrial and commercial buildings of shelter and air-raid precautions training and equipment. Employers in specified areas are compelled to provide shelters for their workpeople in establishments where more than 50 persons are employed and they will be responsible for seeing that workpeople are trained in air-raid routine and that a suitable proportion are trained and equipped for fire-fighting, first-aid and anti-gas measures. Towards reasonable capital expenditure on providing (subject to a time limit) air-raid shelters for employees, Treasury grants per £ of capital expenditure equal to the standard rate of income tax are authorised. Expenditure on training and equipment is generally deductable as a trading expense. Another part of the Bill requires steps to be taken forthwith by occupiers of factories to secure that lights in their premises can be obscured and, where appropriate, they can be required to camouflage the factory buildings.

The Daily Log for the Plant

JUST because a thing has been done once it does not follow that the conditions of the case can be repeated with precisely the same result. Minor matters have a peculiar way of changing the course of events, and the true cause may not be immediately apparent. This may concern the yield of some product made by a particular method or by some recognised process which has become so well known that it becomes an instance of "familiarity breeds contempt." There is also the case of plant operation, where changes in methods can give rise to hazards from an unsuspected cause. To be able all the better to meet such circumstances and face results, and incidentally guard against a repetition, it is important to keep a perfect record of plant operations in the form of a daily log. Herein are entered details as to quantities and nature of materials involved in the reaction, the time of doing one thing or another in the technique of operation, and such matters as are relevant to perfect control of the process, i.e., a record of temperatures, pressures, rate of flow in the case of continuous operation, and weight of initial charge and additions for plant operating on intermittent lines. No matter how regular, or how constantly the same, are the particulars which are recorded, there still remains the necessity for keeping accurate records; otherwise, if some slight change is made, either intentionally or inadvertently, there will be no evidence by means of which the precise moment or sequence can be fixed for repetition or avoidance. If anything has gone in a direction otherwise than expected, details of the circumstances are immediately forthcoming from the plant log and the real cause stands in good prospect of being traced. The accurate keeping of a log, moreover, is good training for the mind of the operatives; an orderly mind with precise attention to detail can do much for general safety, as well as for the exact repetition of manufacture as regards quality of product and the yield.

Industrial Process Control

WHILE the subject of the third Conference on Industrial Physics held in Leeds under the auspices of the Institute of Physics last week was "Physics in the Textile Industries," the papers presented dealing with such matters as humidity, colour and colour rendering, and heat effects in fibres, a paper by Dr. M. C. Marsh contained some comments on the introduction of physics into the older textile industries which are relevant to several other industrial manufacturing processes. He said that the practical man had often asked why should instruments and scientific methods be brought in to do what he could achieve by his own judgment. While there was a great deal to be said for this point of view, Dr. Marsh pointed out that there were great advantages in relying on instruments rather than on human judgment—the results were given in figures and the same results could be obtained year after year irrespective of the health or variability of the individual. He added that increasing international competition in the textile trade and "inter-textile" competition, as the result of the introduction of artificial fibres, meant that the only way to survive was to maintain the highest possible efficiency. This is equally true of the chemical industry; one of the greatest aids to efficiency is to control the process by physical measurement.

Nonsensical Doctrine that War is Inevitable

BUSINESS men ought to be grateful to their trade papers. They are certainly getting a minimum of comfort from the widely circulated papers of more general character. "Jitters" has been written over these sheets for the last fortnight. The international situation is admittedly difficult, but it is not only absurd but unpatriotic to say that British statesmanship is bankrupt. On the contrary it is very much alive to the need for the maintenance of British prestige in the world, and for the damping down of warmongers wherever they may raise their heads. The doctrine of the inevitability of war is as great nonsense to-day as it was at the time of the Prime Minister's flights to Germany last September. An issue such as the present does not suggest that trade has lost confidence in itself and in its country. On the contrary it gives many signs of the common-sense and helpful approach to current problems which British commerce and industry are supremely fitted to make out of the wealth of their accumulated experience.

The Rôle of Catalysis in Petroleum Chemistry

American Chemical Society's Symposium

A JOINT symposium of the Division of Petroleum Chemistry of the American Chemical Society with the Division of Industrial and Engineering Chemistry on the Rôle of Catalysis in Petroleum Chemistry is to be held at Baltimore, Maryland, on April 4. The following abstracts of papers are selected from the large number to be presented at the symposium.

Catalysis and Polymerisation. Robert E. Burk (Western Reserve University).

Catalysis and polymerisation are of wide importance in nature, so that work of the petroleum industry in these fields will have a wide influence. Few polymerisations proceed in the absence of catalysts. Catalysts important to the petroleum industry are halides, acids, oxides, clays, oxidising agents, metals, and organometallic compounds. The first four classes probably all act as acids through an intermediate compound mechanism. Peroxides have been grossly neglected from the theoretical side. Metals are unimportant. Organometallic compounds probably give rise to a free radical chain mechanism when they are decomposing. Photochemical studies should aid in evaluating the part played by free radicals in polymerisation.

Alkylation of Hydrocarbons. Gustav Egloff and J. C. Morrell (Universal Oil Products Co.).

The alkylation of hydrocarbons is one of the most important reactions both from a scientific and commercial viewpoint. Alkylation of aromatic hydrocarbons is relatively simple and has been known for over a period of fifty years. Alkylation of paraffin hydrocarbons has been considered impossible because of the well-known inactivity of paraffins. However, this reaction has been accomplished in the presence of catalysts and has many possibilities in the production of valuable liquid hydrocarbons from normally gaseous hydrocarbons. For example, isobutane may be alkylated with ethylene, propene, and butenes to produce isomeric hexanes, heptanes, and octanes useful as high anti-knock motor fuels, particularly for aviation.

Advantage of Alkylation Process

One of the important aspects of the alkylation reaction is the elimination of the hydrogenation step in the formation of isoparaffins produced by the polymerisation of olefines and subsequent hydrogenation. The alkylation process thus has the distinct advantage over polymerisation and hydrogenation in accomplishing the same purpose in a single step by eliminating the latter step. Catalysts such as sulphuric acid, boron fluoride, and aluminium chloride have been used for the alkylation of paraffins by olefines.

The Production of High Octane Isoparaffinic Fuels by the Addition of Olefines to Isoparaffins. H. S. F. Birch, A. E. Dunstan, F. A. Fidler, F. B. Pim, and T. Tait (Anglo-Iranian Oil Co.).

Although preliminary work indicated the general nature of the sulphuric acid-catalysed addition of olefines to isoparaffins, attention in the authors' earlier communication was mainly directed towards the condensation of butene with isobutane, since these hydrocarbons gave the most promising results which could be easily translated to commercial operation. Other olefine-isoparaffin reactions have been studied and a brief account of some of the results obtained is given. These should be regarded as somewhat exploratory in nature. Of these reactions, the addition of propylene to isobutane and butenes to isopentane appear to offer the greatest promise. Acid requirements are, however, higher than with the butene-isobutene reactions.

The Catalytic Alkylation of Isobutane with Gaseous Olefines. F. H. Blunck and D. R. Carmody (Standard Oil Co.).

At 1,000 lb. per sq. in. pressure and temperatures of about 400° F., isobutane reacts with gaseous olefines under the influence of double chlorides of aluminium and alkali metals, particularly $NaAlCl_4$ and $LiAlCl_4$. The alkylation reaction is accompanied by a varying, but considerable, amount of polymerisation, and by extensive rearrangements, which lead to the production of products not explicable on any simple theory. The life of the catalyst is short, and the alkylation reaction declines more rapidly than polymerisation. Higher temperature favours alkylation, but further decreases catalyst life. The potassium compound is not very active.

Catalytic Isomerisation of Paraffins

Catalytic Isomerisation of Paraffin Hydrocarbons. C. W. Montgomery, J. H. McAteer, and N. W. Franke (Gulf Research and Development Co.).

The literature on catalytic isomerisation of paraffins is reviewed and the fact noted that isomerisation is usually accompanied by side reactions which result in the formation of higher and lower molecular weight paraffins or even more complex mixtures. It is shown that the butanes with sufficiently mild treatment can undergo a reversible isomerisation comparatively uncomplicated by the formation of other products. The equilibrium constant in the liquid phase at 27° C. with five mole per cent. aluminium bromide is between 3 and 4. Data on the kinetics of the reaction are presented and the probable mechanism is discussed.

The Isomerisation of Cyclohexane and Methylcyclopentane. A. L. Glasebrook and W. G. Lovell (Research Laboratories Division, General Motors Corp.).

The reversible isomerisation of methylcyclopentane and cyclohexane catalysed by aluminium chloride containing hydrogen chloride has been confirmed. Not more than 5 per cent. of the hydrocarbon reacting is used in side reactions. The equilibrium has been approached from both sides at 10° intervals over the range of 25 to 77.4°; the mole per cent. methyl cyclopentane in the equilibrium mixture varies from 12.5 to 25° to 25.6 at 77.4°. The equilibrium data have been used to compute the thermo-dynamic constants for the isomerisation reactions. The same constants, calculated from specific heat data, show poor agreement with those obtained from the equilibrium measurements.

Fundamentals in the Catalytic Ring Closure of Open-Chain Hydrocarbons. Hugh S. Taylor and John Turkevich.

The problem of ring closure of open-chain hydrocarbons with formation of aromatics has been discussed from the historical aspect and examined from the standpoint of the available thermodynamic data. The catalytic problem involved has been reviewed from the standpoint of fundamental catalytic properties and available indications from the literature.

With chromium oxide gel as a typical catalyst and normal heptane as typical paraffin hydrocarbon it has been shown that quantitative conversion to aromatic hydrocarbon can be secured. The effects of contact time, poisons, and temperature on the nature of gaseous and liquid products in the case of chromic oxide gel catalyst are cited as typical of a large group of oxide catalysts studied.

Aviation Fuels by High Pressure Hydrogenation

Production of Aviation Fuels by High Pressure Hydrogenation. E. V. Murphree, C. L. Brown, and E. J. Gohr (Standard Oil Development Co. and Standard Oil Co.).

The application of high-pressure hydrogenation to the production of aviation gasolines,, blending agents, and 100-octane fuels is discussed. A typical aviation naphtha hydrogenation plant (flow diagram given) at conversions of 50 to 75 per cent. per pass yields 80 to 95 per cent. of 75 to 78-

octane hydrogenated naphtha having excellent stability, high lead susceptibility, low sulphur content, and good colour. Hydrogenation of isobutylene dimers and isonormal butylene co-dimers increases octane number from 82 to 84, to 97 to 100. Tables showing laboratory inspection data and properties of hydrogenated fuels and polymers, and high-octane aviation fuels produced by blending hydrogenated products are included.

Evaluation of Catalyst Surface Area

Evaluation by the Emanation Method of the Surface Area of Metallic Hydrogenation Catalysts. I. D. Kurbatov.

Copper or nickel catalysts in which either radium or thorium X has been uniformly distributed will emit the corresponding emanation (Em.P.) from a depth of solid matter not exceeding a certain maximum distance from the surface. The distance through which the emanation is able to travel in solids is determined by the nature of the solid and by the energy of recoil of the emanation atoms.

Using the calculated values 372 Å. and 343 Å. as the ranges for thoron recoil in copper and in nickel, respectively, the surface areas of catalysts with various emanating powers have been calculated. It was found that when emanating power is equal to 0.15 per cent., the surface area of 1 gram of copper catalyst will approximate 0.018 sq. m. and that of nickel 0.02 sq. m. When the emanating power reaches 60 per cent., the surface area will be about 9.06 sq. m. for copper and 9.83 sq. m. for nickel. It was shown experimentally that differently prepared hydrogenation catalysts with different hydrogenation ability lie chiefly in these limits of emanating powers.

The Catalytic Cracking of Aliphatic Hydrocarbons. Gustav Egloff, Jacque C. Morrell, Charles L. Thomas, and Herman S. Bloch.

An activated silica-alumina catalyst has been employed at atmospheric pressure with a *n*-butene mixture at 385° to 600° C., pentene-1 at 400° C., a mixture of octenes-1 and -2 at 375° to 400° C., cetene at 300° to 400° C., *n*-octane at 525° to 570° C., and cetane at 500° C. All of the olefines studied underwent isomerisation to the corresponding iso-olefines, accompanied by cracking to lighter products, and, in the case of the butenes and pentene, by polymerisation. Octane and cetane were catalytically decomposed largely to three-, four- and five-carbon atom products. The paraffins were much more stable than the olefines of the same chain length, and the shorter chain hydrocarbons were more stable than their higher homologues.

Catalytic Effect of Metals on Paraffins

The Catalytic Effect of Metals on Paraffin Hydrocarbons. Charles L. Thomas, Gustav Egloff, and Jacque C. Morrell (Universal Oil Products Co.).

As catalysts, metals are potentially capable of fostering carbon-carbon scission or cracking, dehydrogenation to form olefines, and complete decomposition to carbon and hydrogen. From the available data there is no metal that sponsors catalytic cracking or carbon-carbon scission. There is some evidence to indicate that copper and palladium are capable of sponsoring dehydrogenation to form olefines, although copper is comparatively inert unless specially prepared and palladium has a tendency to promote carbon formation. Iron, cobalt, and nickel are very powerful catalysts fostering the complete decomposition of paraffin hydrocarbons to carbon and hydrogen. It is possible that this catalytic reaction is not noticed in commercial cracking equipment because there is enough sulphur present in the oil to poison this catalytic action of the metal.

The Suppression of Metal Catalysts in Gasoline Gum Formation. F. B. Downing, R. G. Clarkson, and C. J. Pedersen (E. I. du Pont de Nemours and Co.).

Gasoline is frequently contaminated with traces of metals, especially copper, which possess powerful pro-oxidant action. Antioxidants that are effective in retarding auto-oxidation and gum formation caused by peroxides, are inefficient in counteracting the effect of such metal catalysts. Gasoline-soluble compounds capable of suppressing the pro-oxidant effect of metals have been found and their use in conjunction with antioxidants is described.

The Effect of Engine Metals on the Deterioration of Motor Oil. F. B. Downing, G. E. Holbrook, and J. H. Fuller. (E. I. du Pont de Nemours and Co.).

The predominating effect of engine metals on the deterioration of motor oil is revealed by accelerated engine tests before and after selected surfaces in the engine were protectively "lacquered" by resin films from the lubricant. The catalytic effect of iron is greatest probably because of the more extensive surface exposed. Of the common bearing metals, copper-lead is most active, while babbitt and silver-cadmium show mild but positive catalytic effect. A method of reducing the effect of metals while improving stability of the oil and reducing bearing wear is shown by parallel engine tests in the presence of a phosphorus oil additive.

GENERAL PAPERS TO BE PRESENTED

On April 5 several general papers are to be presented, of which the following are abstracts:

Catalytic Hydration of Olefines. V. N. Shiffler, M. M. Holm and L. F. Brooke (Standard Oil Co.).

This paper presents the results of experimental work on the hydration of ethylene and propylene with a sulphuric acid catalyst. Sulphuric acid proved to be an active catalyst for the hydration of ethylene and propylene at relatively low temperatures where the equilibrium is favourable for high yields of alcohols. Typical acid concentrations and temperatures were respectively 70 per cent. and 150° C. for ethylene hydration, and 55 per cent. and 115° C. for propylene hydration. Measurement of the equilibrium constant for alcohol formation under these conditions gave Kp 0.049 for ethylene hydration and Kp = 0.1 for propylene hydration. These values are in fair agreement with published data. Operation under pressure increased the rate of alcohol production, the concentration of alcohol in the product, and decreased the amount of water required for maintaining the acid concentration constant. Pressure also increased the ratio of ether to alcohol in the product with ethylene but not with propylene. Some phases of commercial application of the process are considered briefly.

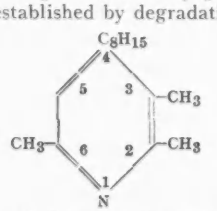
Gum Formation in Cracked Gasolines. D. L. Yabroff and E. L. Walters (Shell Development Co.).

The formation of gum during the induction period of cracked gasolines has been found to proceed at a simple exponential rate at elevated temperatures. The time required for a gasoline to reach a gum content of 10 mg. per 100 ml. (designated as the 10-mg. gum time) is effected by temperature and oxygen pressure in essentially the same manner as is the induction period. The 10-mg. gum time can accordingly be extrapolated to storage conditions, allowing a prediction of the storage life of the gasoline.

Structure of a Nitrogen Base

Structural Study of a $C_{16}H_{23}N$ Base from California Petroleum. Stiles M. Roberts and J. R. Bailey.

The structure of the $C_{16}H_{23}N$ (I) nitrogen base isolated from petroleum by Thompson and Bailey (*J. Am. Chem. Soc.*, *53*, 1,002) has been established by degradation to be:



The location of methyl groups at position 2 and 6 of a pyridine nucleus was established by formation of a phthalone

(Armendt and Bailey, *ibid.*, 1933, *55*, 4,145) and by oxidation of the formaldehyde condensation product to yield $C_{14}H_{19}N(COOH)_2$ (II) which on decarboxylation yielded the second lower homologue, $C_{14}H_{21}N$ (III) (Lackey and Bailey, *ibid.*, 1934, *56*, 2,741).

Fuming nitric oxidation of I to give berberonic acid established proof of alkylation at positions 3, 4 and 6. Further proof of methylation at positions 2, 3 and 6 was established by Mahan and Bailey in pyrolysis of I to 2, 3, 6-trimethylpyridine. I on reduction yielded $C_{16}H_{30}NH$, a secondary amine, whose benzoyl derivative on treatment with phosphorus pentabromide followed by distillation under reduced pressure yielded $C_{16}H_{30}Br_2$ (IV) (Cf. J. von Braun, *Ber*, 1905, 2,338). By refluxing IV with methyl alcoholic potassium hydroxide a doubly unsaturated hydrocarbon, $C_{16}H_{28}$, was produced which on ozonisation, followed by alkaline hydrolysis, yielded acetaldehyde and a monocarboxylic acid, $C_8H_{15}CH_2COOH$ of either cyclopentyl or cyclohexyl structure. The similarity of physical and chemical properties indicate the so-called " nonaromatics " to be of similar structure.

Isolation of New Quinoline Homologues

Isolation of 2, 4-dimethyl-8-ethylquinoline, 2, 4-dimethyl-8-n-propylquinoline, 2, 3, 4-trimethyl-8-ethylquinoline and 2, 3, 4-trimethyl-8-n-propyl quinoline from California Petroleum and Proof of Structure through Degradation and Synthesis. W. N. Axe, R. A. Glenn, L. M. Schenck, and J. R. Bailey (University of Texas).

The new quinoline homologues, 2, 4-dimethyl-8-ethyl- and 2, 4-dimethyl-8-*n*-propylquinoline, along with 2, 3, 4-trimethyl-8-ethyl- and 2, 3, 4-trimethyl-8-*n*-propylquinoline, have been isolated from California petroleum with structures established through degradation and synthesis, the intermediates used being either acetylacetone or methylacetylacetone and *o*-ethylaniline or *o*-*n*-propylaniline. Of the keroquinolines encountered to date, each is methylated at position 2, the other positions of substitution being 3, 4, or 8. No substitution has been observed at positions 5, 6, or 7. Alkyls higher than methyl have been found at no position other than 8, where methyls are present in four, ethyls in three, and *n*-propyls in three of the quinoline homologues. The keroquinolines 2, 3- and 2, 4-dimethylquinoline added to the above bases comprise a total of 12.

Alkaline Extraction of Mercaptans

Extraction of Mercaptans with Alkaline Solutions. D. L. Yabroff (Shell Development Co.).

It is shown that the differences in the extractability of the various mercaptans from an oil phase by an aqueous alkaline solution are due almost entirely to differences in the solubility of the unneutralised mercaptan in the aqueous phase, rather than to differences in the acidity of the various mercaptans. As the sodium hydroxide concentration in the aqueous phase increases, the improvement in the extraction of mercaptans becomes less than might be expected from the higher caustic concentration. This is due to the " salting-out " of the unneutralised mercaptan from the aqueous phase by the sodium hydroxide. The extent of the extraction of mercaptans increases as the temperature is lowered, and this is due essentially to decreased hydrolysis of the mercaptide in the aqueous phase.

Rapid Method for the Determination of Aromatic Hydrocarbons. Aristid V. Grosse and Richard Wackher (Universal Oil Products Co.).

The method consists in determining the specific dispersion of the hydrocarbon sample boiling in the gasoline range. It is based on the fundamental fact that the specific dispersion of saturated hydrocarbons (paraffins and mono- or polyring naphthenes) are constant and independent of their molecular weight. The specific dispersion increments due to aromatics or olefines are, with reasonable accuracy, straightline functions of their concentrations. The contribution of olefines to the specific dispersion increments can be readily evaluated from the bromine number of the sample.

The weight per cent. of aromatics is given by the formula:

$$\text{Weight \% aromatic} = \frac{\delta_{\text{mix}} - 0.2 \times \text{Br. No.} - 99}{\delta_{\text{aromatic}} - 99} \cdot 100$$

if the dispersions are taken for the H_β and H_α lines. The determination of specific dispersion is readily made on any standard Abbé refractometer or more accurately by the Pulfrich refractometer. Results obtained by the above method are in reasonable agreement with those obtained by standard methods.

Composition of Lubricating Oil

Composition of Lubricating Oil. Properties of Lubricating Oil Fractions Separated by Distillation and by Extraction. K. A. Varteressian (Esso Laboratories, Elizabeth, N. J.); M. R. Fenske (Pennsylvania State College) and H. S. Smith (The Texas Co.).

No matter what the problem may be in connection with the identification and the current or potential utilisation of lubricants as materials of industry and commerce, a knowledge of the chemical composition of these oils is of prime importance. This work is an attempt at introducing the chemical viewpoint in dealing with problems that concern oils. It is believed that such a viewpoint, even though an approximation at the present time, will provide a more sound approach to the important problems of (1) the intelligent selection and utilisation of oils for specific purposes, and (2) the reasonable choice of bases on which correlations of laboratory tests and of service performance should be founded.

Through efficient distillations, extractions, and combinations of these two operations, the investigated oil has been separated into its component parts and the viscosities, densities, refractive indices, dispersions, and aniline points of these parts have been determined. By means of these data, conclusions as to the probable chemical compositions of the oil and its fractions have been formulated. The different manner in which the operations of distillation and of extraction classify the component parts of the oil has been definitely determined from a quantitative chemical composition standpoint.

Microviscometer. John R. Bowman (Mellon Institute of Industrial Research).

A new type of viscometer is described, primarily designed for the examination of samples less than 0.1 gram, but satisfactory for general viscometry. The principle is the determination of the rate of fall of a short segment of liquid entirely contained in a longer capillary tube. The several sources of error, together with their corrections, are discussed. The instrument is a small, self-contained, portable unit, having an absolute accuracy of better than 4 per cent. and a precision within 0.1 per cent.

Determining Molecular Weights of Oils

The Determination of the Molecular Weights of Oils. John R. Bowman and William E. Hanson (Mellon Institute of Industrial Research).

A new modification of the boiling point method for the determination of molecular weights, particularly applicable to oils, is described. The equipment consists essentially of a vacuum-jacketed boiler of the Cottrell type, adapted for use with the Menzies-Wright differential thermometer. Heat is supplied electrically through a chromel wire coil. The apparatus is so constructed that no adjustments are necessary; the fixity of all parts not only makes for a more rugged and easily operated instrument, but also assures identical conditions for each experiment. The results obtained on several pure compounds and a variety of petroleum products are given.. A single determination requires about two hours and yields results with an error of less than 1 per cent. Commercial benzene serves as solvent.

Testing Refractories—Air Cooling Tank Blocks—Creep of Refractory Materials

Papers presented at Society of Glass Technology Meeting

AT the 201st meeting of the Society of Glass Technology held in Stourbridge on March 15, with the President, Dr. C. J. Peddle, in the chair, three papers were communicated, of which the following are abstracts:—

The Application of Specifications and Tests to Refractory Materials. G. V. Evers, F.S.G.T.

In this paper Mr. Evers reviewed briefly various tests that were used for specifications and pointed out their limitations. He then pleaded for new specifications which were neither impossible, nor too vague, nor self-contradictory.

Refractory Test.—This test may give very divergent results according to the technique of the laboratory and Mr. Evers quoted a case where samples of the same brick sent to two different laboratories were reported to squat over at cone 28 and cone 30. As cone 29 is the low level it is important which of these results is correct.

Refractoriness Under Load.—The conclusions from this test were often faulty. In the test the brick was heated on all four sides whereas in practice only one side was heated. The test specified that the refractory must be stable under 50 lb./in² at 1,400 C. This was probably a much higher limit than would be required for most cases in practice.

Porosity.—This test in conjunction with the refractoriness and after contraction could give good results; but often porosity figures are taken as a measure of the resistance to spalling.

Spalling.—The quenching test at present employed is too crude and severe. The test makes no distinction between refractories that lose 20 per cent. as one piece or in small flakes. Further, the difference between thermal spalling due to temperature fluctuations and structural spalling due to slag penetration should be emphasised.

Permeability.—In exceptional cases, a high porosity may be accompanied by a low permeability, but generally, porosity and permeability run in line. Mr. Evers cited several cases where both properties decreased together up to 1,400° C. and then the porosity decreased and permeability increased. Other examples of different behaviour were also indicated.

After Contraction and After Expansion.—This test, too, requires modification, for the above two properties may mask one another and cause a poor brick to be mistaken for a well fired brick. On the other hand, a well fired brick may be rejected on the basis of this test.

Carbon Monoxide Penetration.—The principles of the method of testing were agreed, but there were still differences in detail. Therefore, where any specification was required, it should be definite and state for how long under given conditions the refractory must stand up against any sign of disintegration.

Texture.—A uniform texture and freedom from flaws cannot be given a figure of merit and it would be useful if a value for expressing the texture of a refractory could be derived.

The Air Cooling of Tank Blocks. W. M. Hampton, Ph.D., B.Sc., F.Inst.P., A.I.C.

No allowance in these calculations was made for the effect of circulation of the glass, but it was worth considering that forced air cooling might even increase the circulation of the glass near the walls. It was clear that if circulation in a tank could be prevented, solution of the refractories would rapidly cease as the glass in contact with the walls became saturated with dissolved clay. Solution only continued because fresh supplies of glass were continually brought into contact with the walls of the tank. This circulation of glass was brought about primarily by:—

(a) The changes in density due to solution of refractories.

(b) The cooling of glass in contact with the walls and the change in density brought about by this cooling.

(c) The flow through the tank due to withdrawal of glass.

If, therefore, a perfectly insulated tank wall were possible so that the temperature of the glass and wall were identical, the second cause of circulation would be removed and the attack must necessarily decrease. If this argument be followed, it led to the conclusion that air cooling might *increase* the rate of solution by increasing the currents with a thermal origin.

The general conclusion of this investigation was that the only application of air cooling which would appear to be justified was when holes in the block or other local conditions caused "hot spots" to appear on the outside. In such a case the local application of air might avoid a breakdown. Further, where by means of the configuration of the tank radiation to cool surfaces was largely prevented, it might be necessary to compensate for this by means of forced air convection. Apart from these two special conditions it seemed, on the basis of this paper, difficult to justify the expense involved for the installation of apparatus for providing compressed air for cooling.

The Creep of Refractory Materials at High Temperatures and its Bearing on the Performance of Glass House Pots. J. H. Partridge, B.Sc., Ph.D., F.S.G.T., and G. F. Adams, B.Sc.

The method of test was to stretch the specimens under a small load at various temperatures and to measure the amount of creep. Tests showed that aluminous clays stretched fairly rapidly and that siliceous clays stretched slowly. These last types were very porous and liable to corrosion, but by bonding a siliceous clay with 20 per cent. of an aluminous clay, the resulting mixture did not suffer from creep and was more stable to corrosion.

In general, refractories contained crystals of mullite and forms of silica in a glassy matrix. The glassy matrix of composition 94 per cent. SiO_2, 5½ per cent. Al_2O_3 melted in a molybdenum crucible formed a glass which softened at 1,200° C. Impurities in the matrix lowered its fusion point and the specimen would creep rapidly. The creep of a specimen was due to two causes: (a) by extension due to re-crystallisation of the silica and (b) by extension due to creep of the glassy matrix. This was shown graphically by comparing an unstabilised specimen with one which had been stabilised by loading it 100 hours after it had been in the furnace at 1,350°. The creep in this case was very small.

The effect of impurities was shown in the table, where the temperature represents the temperature at which the specimen failed under a rapid tensile test.

Substances.	*Temp. of Failure.*
Pure sillimanite	1740° C.
Pure mullite.	1740
Cast sillimanite.	1640
Fire brick.	1510-1540.

Dr. Partridge then described attempts to manufacture by a combination of slip casting and machine pressing, pots containing pure artificial mullite, with a matrix of the eutectic melted above.

To investigate the failure of refractories due to diffusion of a glass constituent tests were carried out with hollow specimens into which boric acid was continually fed. The creep tests showed that the specimen failed more rapidly than a similar specimen to which no boric acid was added. This introduces the problem as to whether or not it is worth while making highly refractory pots, when diffusion of glass constituents might cause serious weakening.

Chemical Matters in Parliament

Alcohol Duty

IN the House of Commons last week Mr. R. Morgan asked the Chancellor of the Exchequer whether he would consider taking steps to reduce the allowance of 8¾d. per gallon on absolute alcohol which was now excessive.

Sir J. Simon: The assumption in the concluding words of the question could only be decided by prolonged inquiry at the distilleries, upon which, as at present advised, I am not satisfied that there is ground for embarking.

Land Fertility

In the House of Commons on March 24 Mr. Guest asked the Minister of Agriculture whether his attention had been drawn to the still existing shortage of supplies of fertilisers in Wales; what was the reason for that shortage and when he anticipated the supply would be equal to the demand.

Sir R. Dorman-Smith replied that he was not aware that there was any shortage of fertilisers generally in Wales. If Mr. Guest's question was intended to refer to supplies of basic slag under the Land Fertility Scheme, the position in the current fertiliser season was slightly more favourable than it was last season, 33,000 tons having been delivered up to and including March 11, 1939, as compared with 32,000 tons in the corresponding period of last season. Supplies of basic slag were, of course, dependent on the output of certain kinds of steel of which it was a by-product, and there was reason to anticipate that increased supplies of slag would shortly be available as a result of the increased production of steel.

In the House of Commons on March 27 Colonel Ropner asked the Minister of Agriculture whether he was aware that farmers were experiencing difficulty in obtaining their requirements of lime and basic slag; and whether the Government intended to extend the provisions of the Agriculture Act, 1937, for a longer period than that contemplated under the Act.

Sir R. Dorman-Smith replied that his information was that there was no general shortage of supplies of lime, but the Land Fertility Committee would be glad to inquire into any cases of difficulty. He was aware that the available supplies of basic slag were not sufficient to meet the increased demand caused by the Land Fertility Scheme. The position in that respect should improve in the near future as a result of the increased output of steel. As regards the second part of the question, it would, he said, be premature at this stage to consider the question of further extension.

INDIAN DRUG CONTROL LEGISLATION

The Indian Chemical Manufacturers' Association has addressed a communication to the Government of India emphasising the importance and the urgent necessity of the Government enacting a comprehensive central legislation to regulate the import, manufacture, storage and sale of drugs in India. A draft bill forwarded by the Association provides for penalising the manufacture, trade, etc., of adulterated and misbranded drugs and also recommends the establishment of a Drug Control Board in order to advise the Government of India in all matters connected with the control of drugs. While recommending the recognition of all foreign pharmacopœias as also standard works on materia medica or on drugs, the Association stresses the importance of compiling an Indian pharmacopœia which would include all Indian drugs, many of which are not found in any pharmacopœia.

THE Continental Rubber Works (Continental Gummi-Werke A.G.) Hanover are extending works on 300,000 square metres of ground; these extensions will be equipped primarily for manufacture of synthetic plastics of new types. The cost is estimated at 24 million R.M.; the company recently distributed dividend at 14 per cent.

The Oil and Colour Chemists' Association

21st Anniversary Dinner

THE 21st annual dinner of the Oil and Colour Chemists' Association was held at the Park Lane Hotel, London, on March 24. The President, Mr. A. J. Gibson, was in the chair and there were 262 members and guests present.

SIR DAVID MEEK (Trade Commissioner for India) proposing "The Oil and Colour Chemists' Association," said it would probably be felt that there was very little obvious connection between the Indian Trade Commissioner and the work of the Association. The connection, however, was closer than would appear at first. One of the main functions of the Indian Trade Commissioner in London was the encouragement of the export of Indian materials to this country, and the country whose interests he represented in this field of activity was the source of very large supplies of a number of the raw materials essential to the oil and colour and associated industries. India was the only country which produced jute, and jute was the real raw material for one of their largest industries, namely, the linoleum industry. India also produced lac in various forms, linseed and linseed oil, castor oil and many other products which were used in the oil and paint industries.

There was another aspect which brought them together, and that was the aspect of research. In any country such as India which produced raw materials, research must be given due importance, and for many years past, practically since the beginning of the century, the Government of India and the various Associations in India had given not only due regard but considerable funds to research. India supplied the raw materials and products of Nature which varied very widely. It was the object of research to try and remedy these variations or at least to keep the range of the variations within reasonable proportions. Naturally, they were always up against synthetic or artificial substitutes for natural products, and the artificial products had many advantages over the natural product, but it was rather strange that the natural products often possessed some characteristic which it was extremely difficult for the research chemist to produce in his substitute. Therefore, in India they had spent considerable sums on research—and were still spending large sums—with the object of retaining interest in the natural products and from the point of view of standardising the goods which India sold.

All the large factories had research laboratories and research staffs. Much of the time in those laboratories was taken up in testing the raw materials which were used in the industries with which the Oil and Colour Chemists' Association was concerned, and consequently the development of the standardisation of raw materials by means of tests agreed as between the producer and the consumer, and embodied in buying specifications, was a development in the right direction. It was here that the consumer could help the producer to the greatest possible extent by stating clearly what his requirements were. It was then for the producer to deliver material in accordance with those requirements.

MR. H. D. BRADFORD then gave a historical review of the formation and development of the Association, and the President, MR. A. J. GIBSON, responded to the toast proposed by Sir David Meek.

DR. H. H. MORGAN, the only member present who had attended the first annual dinner of the Association, 21 years ago, paid a tribute to the president and the work he had done for the Association. He then handed to Mr. Gibson a golden key as a token of respect and of the high esteem in which all the members of the Association held him.

A SOAP factory known as Mytilene E.S.E.M. Company has been founded at Mytilene with a capital of 4.5 million drachmas. Olive oil will be used as raw material.

The Mechanism of Polymerisation

Application of Kinetic Theory of Chemical Reactivity to its Determination

IN a paper entitled "The Mechanism of Polymerisation" read by Dr. H. W. Melville to a joint meeting of the Manchester and District Section of the Institution of the Rubber Industry, the Manchester Section of the Society of Chemical Industry, and the Chemical Society held on March 20, at Manchester, the author dealt with one particular aspect of polymerisation reactions and the reactions and properties of big molecules generally. The question of endeavouring to understand something concerning the peculiar properties of big molecules, he stated, could really be approached in two different ways. On the one hand, there were the big molecules in nature such as rubber, cellulose, etc. By an examination of the chemical and physical properties of such molecules it was possible to gain some idea of their structure, and also the information might enable the investigator to predict what properties and what behaviour such molecules would exhibit.

On the other hand, the reverse procedure might be adopted. An attempt might be made to synthesise such molecules so that by controlling the synthesis in a very exact manner there could be correlation between molecular structure and methods of synthesis.

Synthesising Big Molecules

It was upon this second part of the problem he most especially desired to speak. In order to make a successful attack on such problems it was, of course, necessary to carry out the synthesis under the most rigidly controlled conditions, so that the molecules might be built up to any specified form and architecture. In physical chemistry there existed at present a fairly satisfactory kinetic theory of chemical reactivity. If observation was made of various factors on the rate of reaction then it became possible by means of that theory to formulate a mechanism for the reaction. Dr. Melville then considered the application of this kinetic theory of reactivity to the problem of synthesising big molecules. He pointed out that unfortunately the theory was most highly developed for reactions in the gaseous phase and was less highly developed in the liquid phase. The discussion had therefore to be confined virtually to derivatives of ethylene.

Polymerisation of ethylene derivatives had been known for a long time. Nowadays it had been carried out for the production of synthetic resins and later of synthetic rubbers. As the kinetic theory did not apply exactly the liquid phase of polymerisation had to be left out of the question for the time being. This meant that it was necessary to study the gaseous polymerisation of molecules like ethylene, acetylene, etc., but the unfortunate thing about such simple molecules was that they were very difficult to polymerise. Ethylene had to be compressed to very high pressures before it would polymerise thermally and experiments were difficult to carry out for the purpose of obtaining some idea of the mechanism of the process by kinetic means. Another way of polymerising such molecules was to irradiate them with a light which they themselves would absorb.

Mechanism of Polymerisation of Ethylene Derivatives

Dr. Melville then dealt at length with a description of the application of the methods of chemical kinetics to the determination of the mechanism of the polymerisation of ethylene derivatives, discussing mainly the photochemical reactions in the gas phase. He showed how it was possible to determine the molecular statistics of polymer growth, how the active polymers were rendered inactive, how the length of the product might be computed, and how long it took for the polymer to grow to a given size. The phenomena of inter-polymerisation were also discussed. It was shown how a variety of molecular sandwiches might be built up by using polymers of long life. Employing the same technique it was also possible to establish definitely whether molecules would or would not inter-polymerise with each other.

Swelling and Permeability of Paint Films*

By Dr. A. V. BLOM

THE mechanism of the swelling of paint films is of great practical importance, since the effective life of such materials is often determined by their ability to resist the passage of moisture. A non-swelling film would appear to be very desirable, but such films are generally found to have poor adhesion. It is also desirable in some cases to have permeability of the film, this being the case where paint is applied to wood or wall surfaces, which are damp and which if sealed completely will give rise to a surface breakdown of the paint.

Swelling and permeability are governed by the colloidal state of the film material, hemicolloids with molecular weights under 10,000 having low swelling capacity, whereas encolloids with molecular weights over 100,000 have a high swelling capacity. This however only holds good in the case of straight chain polymers.

The colloidal state of gel structures exhibits powerful action, but a film is only penetrated if the surface tension is so low that it is wetted. In this case swelling is possible. Two kinds of swelling must be considered, and a distinction made between them. Where the water molecules arrange themselves on the surface of the micelles, the swelling is termed intermicellar, but when penetration of the micelles is effected and the water molecules are arranged in the interior of the micelles, this is called intramicellar swelling.

All paint films require certain mechanical properties, and it is desirable to consider the effect of swelling on these. It is essential that they shall have distensibility or elasticity which will enable them to follow the movements of the underlying material, also that they shall have a degree of plasticity. It is certain that the tensile strength is related to the structure of films, and that swelling which is dependent on the structure influences the mechanical properties. This is shown by the fact that a stretched cellulose film shows a decreased swelling power. This is probably due to the difficulty of penetration of the water molecules into the micelles. It should be noted, however, that swollen films show an increased distensibility.

The swelling process acts in such a manner as to produce a transition stage between solid and fluid and, like a gel of gelatine, a paint film approaches the behaviour of a liquid as the swelling increases. At the same time, the tensile strength diminishes. From observation, it would appear that intermicellar swelling was mainly responsible for the change in elasticity.

Plasticity may be regarded as the gliding of micelles over each other due to external forces and intermicellar swelling, reducing the secondary forces, facilitates this gliding process. Water on the surface of the micelles is believed to act as a lubricant and the plasticity is increased. This may have great importance where great hardness is expected from a paint film.

Results of Investigations

An important observation is that the film thickness is a factor which governs the swelling since it establishes the ratio of volume to free surface of the film. Thin films reach swelling equilibrium quicker than thicker ones, but irregularities which have been observed with the former are not evident in the latter case.

Addition of stand oils and blown oils to paint mixings produce more weather resistant films owing to the resistance to swelling. An interesting fact is that with repeated swelling and drying out of the film, the degree of swelling decreases. This point is one which merits further investigation.

Further results of the swelling influence on films has been demonstrated in the performance of the Erichson Test and this, together with the establishment of ageing curves, are instrumental in demonstrating the importance of the swelling of a paint film and its consideration in paint testing.

* Abstract of a paper presented at a recent meeting of the Manchester Section of the Oil and Colour Chemists' Association.

Letters to the Editor

"Staggered" Holidays

SIR,—The new "holiday-with-pay" schemes which will soon be benefiting so many British workers have made the question of the "staggered holiday" one of outstanding importance.

The Works' Committees at Fort Dunlop have realised that the new order of things must make the coming August Bank Holiday more congested than ever, and it has therefore been decided to move this holiday period of the thousands of operatives whom they represent, from the first week of August to August 21—26.

Here is an example of practically-minded "internal legislation" which might well be followed by other important organisations.—Yours faithfully,

DOUGLAS HAIGH,
General Secretary.

National Industrial Alliance,
13/14 Dartmouth Street,
Westminster, S.W.1.
March 17.

Unemployment over Forty

SIR,—Business men are doing so much for refugee and similar organisations and for the alleviation of poverty and distress in other countries, that no apology is needed for an appeal for their co-operation in a movement which calls for no financial sacrifice and is directed solely towards solving a national problem.

There is everything to be said for giving youth a chance, but over-insistence of the plea for "Youth at the helm" is creating an almost hopeless position for many older, and often more experienced workers.

Of insured workers, more than half of those unemployed for over a year are above the age of forty. For non-insured workers there are no statistics, but there is abundant evidence that an enormous number of thoroughly experienced and really well qualified men have been forced out of employment in recent years. It is for such men that this appeal is directed.

The Forty Plus Club is a mutual association of disengaged business men who are trying to bring their problem to the notice of employers, and who make a special appeal that older and more experienced men should be remembered when executive vacancies are being filled. The Club is a co-operative employment agency run by men who are tackling the job of selling one another. It has no funds, dues or subscriptions, and is confined to men of over 40 years of age who have held responsible positions, are capable of doing so again, and are out of work. Credentials must be first class.

Members meet regularly, compare experiences, assist each other in compiling their papers in proper form, and then accept tasks of interviewing specified employers to get jobs for other members. It is this last feature that is unique, and it is working well. Many contacts have already been made, and Rotary and other organisations have been most helpful.

What is now required is a wider support from employers to whom the Club makes a special invitation to co-operate with the work of Forty Plus.

The Club is still looking for a friend who can provide it with a vacant office, but meanwhile information can be obtained from R. C. Martin, 11 King's Bench Walk, Temple, London, E.C.4.—Yours faithfully,

FORTY PLUS.

London, E.C.4. March 27, 1939.

A LARGE factory for the production of activated bleaching earths has been started up at Honfleur by the Carbonisation et Charbons Actif of Paris. The products will be used in the decolorisation of vegetable and mineral oils. Bleaching earths for lubricating and other oils will also be produced in a factory in course of erection at Marseilles by the Soc. Françaises des Glycerines of Paris.

Coloration of Porcelain Enamels

Advantages of Insoluble Stains

SOME general conclusions with regard to the coloration of porcelain enamels are presented by Andrews and Zimmerman as a result of an extensive experimental study (*J. Amer. Cer. Soc.*, 1939, *22*, 65-72). Different coloured stains were added separately to transparent enamels, which were fired on to steel plates on either a white or black groundcoat. The resulting colours were examined by means of a spectrophotometer, the percentage reflectance for each wavelength being measured in the visible spectrum. The effect of fineness of grinding and the thickness of application, as well as the influence of time and temperature of firing, on the resulting colour were investigated.

It was concluded that those stains which do not dissolve in the enamel but remain suspended in it are definitely preferable in most cases. The colours obtained with such stains show only small variations within wide variations of time and temperature of firing. Also, being present as discrete particles, they have a considerable opacity. Substantial differences in thickness of the coat results in only small changes of the percentage reflectance, which is increased by increasing the fineness of the mill batch.

In contrast to the insoluble stains, those which dissolve in the base are very difficult to handle in order to obtain satisfactory results; in particular, the firing conditions are very critical. Of such stains, those are to be preferred which dissolve rapidly in the enamel.

An interesting example of the increasing part silver is playing in modern industry is shown by this illustration of a silver covered copper "U" tube heating unit supplied by Johnson, Matthey & Co., Ltd., for use by The Distillers Co., Ltd., in a vessel containing certain corrosive materials. The copper "U" tubes are covered with "Matthelytic" silver .030″ thick, the end plate with "Matthelytic" silver .060″ thick on one side only, the weight of silver used being 1,080 oz. troy. The total weight of the job when assembled was approximately 5½ cwt. The length of the "U" tubes is 6′ 2½″ o/d and the dimensions of the plate 2′ 4¾″ × 1′ 4½″. The original copper tubes were ¼″ thick.

RECENT TRADE LITERATURE

ELLIOTT BROTHERS (LONDON), LTD. have issued their latest booklet dealing with the electrical method of measuring humidity. The humidity meter has recently been modified and brought up-to-date and the booklet revised to include much more information upon this subject, which is now so important in view of the development of air conditioning in factories and other buildings. The booklet deals with the definition of humidity, the significance of relative humidity, the measurement of relative humidity, the principle of the electrical humidity meter, the construction of the "Siemens" electrical humidity meter and the advantages of such a meter.

Recent improvements and new applications of Bakelite materials in all branches of industry are dealt with in the latest edition of "Bakelite Progress" published by BAKELITE, LTD. Among the new uses for Bakelite reviewed are moulded chain links for conveyors engaged in the transfer of chemicals. The manufacture of junction elbows is another use to which Bakelite has been applied, and here again, the material's high resistance to corrosive fluids is a valuable factor. A new Bakelite moulding material has been recently developed and incorporated in water softeners. The all-moulded "Sussex" water softener has a main container which remains unaffected by the constantly varying temperature of the water.

ADAM HILGER, LTD., describe in leaflet S.B. 106/3 Professor Laby's X-ray spectograph which is intended for the accurate determination of wavelengths by interpolation from accepted standard lines. It is suitable for the identification and determination of the characteristic emissions of elements and thus for X-ray spectrum analysis. The spectrograph employs the photographic method of registration of the lines. The X-ray beam, suitably defined by two slits, falls on the surface of the standard crystal which is in uniform angular oscillation over the selected range. The beams reflected from the crystal at the appropriate angles are received on a photographic film. The leaflet describes also a double crystal holder designed for use with the spectograph. Leaflet SB 138/3, another publication of the company, describes X-ray tubes and accessories for use with Hilger spectographs and crystallographs.

APEX CONSTRUCTION, LTD., British agents for the Stokes Machine Co., report that during the past five years intensified efforts have been made in modernising the Stokes stills. Every model has been re-designed, new and exclusive features adopted, and new models added to the series. The improved Stokes stills are claimed to produce higher quality distilled water, both for the plant or the laboratory. In smaller sizes, the Pyrex glass cover facilitates observation and cleaning. On all the sizes the new triple vapour baffle prevents entrainment of liquid particles, and so produces purer water. The de-concentrator, a controllable device which flushes out the concentrated impurities which collect in the boiling chamber, reduces foaming and scaling, and often obviates cleaning altogether. Stokes machines are on demonstration at the test laboratory of Apex Construction, Ltd., Swan House, 133, Oxford Street, London, W.1.

THE VISCO ENGINEERING CO., LTD., have issued catalogue No. 393 which describes and illustrates their recently introduced Steelshell Forcedraft cooling units for small and medium water capacities and indoor as well as outdoor use. This unit is the natural development of the well-known "Visco" standard fan draught cooler. It has a substantial welded steel shell, the base of which forms the cold water tank. For very small duties, the cooler shell is made in one piece and completely assembled. For medium capacities, the casing is made in sections, and where narrow doorways or staircases have to be negotiated, a panel formation is adopted. In all cases, the erection is exceedingly simple and no foundations are required beyond a flat solid base. The warm water, which enters the cooler near the top, is distributed in a simple, yet effective foolproof manner and descends within the shell over a system of hurdles.

NEW TECHNICAL BOOKS

TEXTBOOK OF INORGANIC CHEMISTRY FOR COLLEGES. By James F. Norris and Ralph C. Young. 2nd edition. Pp. 803. London: McGraw-Hill Publishing Co. 21s.

This book was first published in 1921. In the present edition care has been taken to present only those parts of the newer theories that are helpful in interpreting the facts which should rightly be included in an elementary course on inorganic chemistry. The general aim of the book, as in the case of the first edition, is to present a fundamental course of instruction in which facts and generalisations from these facts are of first importance. Brief accounts are given of the less common elements and their compounds; recently discovered elements have also been described. A chapter on organic chemistry—"the chemistry of carbon compounds"—emphasises the characteristics of the carbon atom which makes possible the formation of so many classes of organic compounds. Over 250 numbered references to books and articles are given in an appendix, and a note of certain numbers is added at the end of each chapter to assist the student in wider reading.

VOLUMETRIC ANALYSIS. By A. J. Berry. Fifth edition. Pp. 196. London: Cambridge University Press. 7s. 6d.

The first edition of this work, published in 1915, was written primarily in the interests of the author's own pupils with the object of providing a practical book, with a sufficient background of theoretical principles, to occupy a position intermediate between that of the elementary works of necessarily limited scope and that of standard treatises on volumetric analysis. Various alterations and additions have been made in subsequent editions, but a more drastic revision has been necessitated for the present edition in view of the rapid progress of analytical chemistry in recent years. A new chapter has been added to deal with certain modern developments in volumetric analysis and the subjects mentioned include adsorption indicators, oxidation and reduction indicators, reduction with liquid amalgams and ceric sulphate as a quantitative oxidising agent. Relatively few alterations have been made in the older part of the book, but two additions, one dealing with lead and the other with phosphates, have been added to the chapter on gravimetric determinations.

NEWER METHODS OF VOLUMETRIC CHEMICAL ANALYSIS. Edited by Wilhelm Böttger. Translated by Ralph E. Oesper. Pp. 268. London: Chapman and Hall, Ltd. 18s. 6d.

Volumetric methods of analysis are especially important to industrial laboratories where speed is a matter of equal consideration to accuracy. Many industrial laboratories, however, are so often confronted with problems demanding immediate attention that the analytical chemist has little chance to follow the current literature of his specialised subject, and also has still less opportunity to test the new methods of which he does read, quite apart from checking the frequently conflicting statements which are made on behalf of new methods. The present volume has been published to assist in this direction, and the editor has had good fortune in the selection of his co-workers. There are seven discussions included. The elimination of the titration error in acidimetric and alkalimetric titrations is a contribution by E. Brennecke, of the Fresenius Chemical Laboratory, Wiesbaden. Ceric sulphate as a volumetric oxidising agent is dealt with by N. H. Furman, professor of chemistry at Princeton University. Alkaline permanganate solution is similarly treated by H. Stamm, of the Chemical Institute of the University of Halle. Iodate and bromate methods, including Manchot's bromometric method, by R. Lang; chromous solutions as volumetric reducing agents, by E. Brennecke; oxidation-reduction indicators, by E. Brennecke; and adsorption indicators for precipitation titrations, by K. Fajans, of the University of Michigan, provide the remaining sections of the book. Each section has an extensive bibliography, in one case running to 177 references.

Personal Notes

MR. GERALD BENSTEAD has resigned from the board of British Coated Board and Paper Mills, Ltd.

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MR. A. P. FAICKNEY has been elected a director of the British Burmah Petroleum Co., to take the place of Dr. A. W. G. Bleeck, who has resigned.

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MR. W. A. DAMON, Chief Inspector of Alkali, etc., Works, was guest at the annual luncheon of the Southern Association of Gas Engineers and Managers, held at the Hotel Victoria, London, on March 24.

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PROFESSOR ISIDOR MORRIS HEILBRON, Professor of Organic Chemistry at the University of London, will receive the honorary degree of LL.D. from the Senate of Glasgow University on June 21.

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DR. E. F. ARMSTRONG, F.R.S., and PROFESSOR T. TURNER, who are old students of the Imperial College of Science and Technology, have been elected to Imperial College Fellowships by the Governing Body of the College.

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MR. J. W. PEARSON, MR. P. D. W. WESTON and MR. F. C. WILLIAMS have been re-elected directors of British Oil and Cake Mills, Ltd., but MR. HERBERT W. MASON, who also retired by rotation, did not seek re-election. Mr. Mason has given 25 years service to the company.

* * * *

MR. D. W. PARKES, head of the research department of Midland Tar Distillers, Ltd., supervised the showing of a film illustrating the methods of testing tar and tarred materials at the Nechells laboratories of the company, at a recent luncheon of the Midland District Tar Board.

* * * *

MR. E. P. THOMPSON and MR. F. S. EVANS have been appointed additional managing directors of Pinchin, Johnson and Co., Ltd., paint manufacturers. MR. G. WISHART has become secretary of the company, in place of Mr. E. P. Thompson and MR. B. H. BENDER has been appointed a director in place of the late Mr. James Hamilton.

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EMERITUS-PROFESSOR JAMES MUIR, who retired last year after 32 years in the Chair of Natural Philosophy at the Royal Technical College, Glasgow, was the guest of honour at a dinner in Glasgow on March 25, when a fund for prizes to commemorate the work of Dr. Muir was formally inaugurated.

* * * *

MR. ROBERT WAITE, M.Sc., has been appointed research assistant in technical chemistry at the Hannah Dairy Research Institute, Ayr, Scotland. Mr. Waite, who had a distinguished career at Manchester University, has had considerable experience in applied research, having studied at the Shirley Institute, at the Fruit and Vegetable Research Station at Campden, and at the research laboratories of the Metal Box Co., Ltd., London.

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MR. J. N. BRADLEY, an assistant metallurgist in the L.M.S. Railway Co.'s Research Laboratory at Derby, has been awarded the Herbert Jackson Prize for 1938, and MR. C. W. NEWBERRY, research assistant in the engineering section of the same laboratory, has also been awarded a Jackson prize. The Herbert Jackson Prize is awarded annually by the L.M.S. in memory of the late Sir Herbert Jackson, K.B.E., F.R.S. (an original member of the L.M.S. Advisory Committee on Scientific Research), to a member of the company's research staff for the best written account of an investigation carried out in the company's laboratories during the year.

OBITUARY

MR. ARTHUR J. AIREY, sole proprietor of Robert Airey and Son, vat builders, died on March 26 following an operation at a Leeds nursing home.

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MR. R. D. DANKS, who at the end of last year retired from the position of manager of Broxburn oil works, Scottish Oils, Ltd., died last week at the age of 70. He had spent all his working life at the Broxburn works.

DR. CHARLES CLAUDE CARPENTER, C.B.E., late president of the South Metropolitan Gas Co., has left estate valued at £31,928 (net personalty £18,588).

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MR. EMILE SCHWEICH MOND, chairman of Ashmore, Benson, Pease and Co., Ltd., and of the South Staffordshire Mond Gas Co., hon. treasurer of the Chemical Society and of the Faraday Society, has left estate valued at £158,897 (net personalty £118,341). The Chemical Society is bequeathed £100 under the terms of his will.

Foreign Chemical Notes

Italy

SNIA VISCOSA OF MILAN are to erect a new plant where rayon of exceptionally high strength will be turned out for the motor tyre industry.

Belgium

THE SOC. BELGE DE RECHERCHES ET D'ETUDES S.A. has been founded in Ghent with a capital of 500,000 francs and will engage in research work in the chemical field.

Russia

THE FURFURAL PROCESS of selective refinement of petroleum oils will be operated in a plant shortly to be started up in Baku in which diesel oils will be the chief product.

TESTS OF THE POSSIBILITIES OF BORON-MAGNESIUM FERTILISERS with a variety of plants have proved so encouraging that the Buiski Chemical Works has been asked to deliver 1,000 tons in the current year.

France

THE SOCIETE SYNTHESE ET FERMENTATION, 15, avenue de Messine, has been formed with a capital of 2 million francs with the participation of leading industrial concerns to undertake development of a variety of chemical processes in the fermentation and motor spirit field. Among the sponsoring concerns are the Mines Domaniales de Potasse de l'Alsace, the Société Française Industrielle et Commerciales des Pétroles and the Société Françaises des Distilleries de l'Indochine.

Japan

THE PEAT-HYDROGENATING PLANT of the Toa Chemical Industry Company is now operating with a daily input of 20 tons peat.

METHYLENE CHLORIDE in a monthly output of 10 tons is now being produced by the Saito Sulphuric Acid and Soda Company.

FLUORSPAR MANUFACTURE will be undertaken by the newly-formed Japanese Fluorspar Mining Company (Nippon Fukka Kogyo K.K.) which has a capital of 400,000 yen and will start with an output of 3,000 tons fluorspar, later to be increased to 5,000 tons.

WITH A VIEW TO EXPANDING THE CAMPHOR OUTPUT, the government are making a free distribution of 3 million camphor trees (in addition to 3 million previously distributed), while it is also proposed to subsidise planting and give free technical advice.

General News—From Week to Week

ACCORDING TO ESTIMATES published on March 25, the Government proposes to increase its beet sugar subsidy by £450,000 to £3,000,000, and its expenditure on land fertility improvement by £101,361 to £1,539,900.

KEY INDUSTRY DUTY.—A representation has been made to the Board of Trade under Section 10(5) of the Finance Act, 1926, regarding sodium di-octyl sulpho-succinate. Any communication should be addressed to the Principal Assistant Secretary, Industries and Manufactures Department, Board of Trade, Great George Street, London, S.W.1, before April 22, 1939.

ACCORDING TO A MEMORANDUM issued by the Department of National Revenue, Canada, (customs division), " Lactic Acid, 44 per cent. Dark Grade " has been transferred from the category of " a class or kind not made in Canada " to that of " a class or kind made in Canada." The ruling became effective yesterday (Friday).

THE CLIMAX MOLYBDENUM CO. OF EUROPE, LTD., was established on March 1, 1939, with offices at 2 and 3, Crosby Square, London, E.C.3. The company has been formed purely as a means of furthering the uses of molybdenum by the dissemination of technical information and co-operative research. Mr. W. F. Rowden is in charge of the company's activities.

AT SOUTHWARK COUNTY COURT ON MONDAY, an agreed settlement was reached between an employee of Walter Parker and Co., Ltd., lead manufacturers, and the company, in a compensation claim under the Workmen's Compensation Act. The employee alleged that he had contracted dermatitis after being employed by the respondents, and the claim was settled on payment of £150 in full and final settlement.

A MOVEMENT IS NOW IN PROGRESS in Scotland to ensure co-operation between agricultural colleges and merchants supplying fertilisers and feeding stuffs with the object of offering improved services to farmers, who for many years past, have been flooded with advice on fertilisers and feeding stuffs. Contact has been made between three Scottish colleges of agriculture and representative merchants in their respective areas, and meetings have taken place in Edinburgh, Glasgow, and Aberdeen, at which it has been agreed by both parties that it was desirable that closer co-operation should exist, and that it would be for the good of agriculture if the fertiliser industry were to supply mixtures based on college recommendations.

THE ANGLO-INDIAN TRADE AGREEMENT which was signed on March 20, with the object of replacing the Ottawa Agreement, was rejected by the Indian Legislative Assembly at New Delhi on Tuesday. The Government has to decide immediately whether or not to implement the decision of the Assembly.

AN EXPLOSION which occurred at the Faversham factory of Heaters, Ltd., explosive manufacturers, on March 25, caused the deaths of three men, including the manager of the factory, Mr. J. G. Braystones La Praik. The factory consists of about 30 wooden buildings, and the explosion occurred in one of the danger buildings surrounded by a mound of earth, almost in the centre of the area covered by the factory. A crater 20 ft. deep was blown in the ground. Fire followed the explosion, but it was extinguished before it had a chance to spread.

IT HAS BEEN AGREED that certain patents and processes owned by Imperial Chemical Industries, Ltd., Boliden of Sweden, the Chemische Industrie of Basle, and Lurgi Chemie of Germany, shall be pooled. This, it is stated, will enable the best process or combination of processes to be applied to each particular problem. In view of the fact that the specific object of Lurgi Chemie is the design and construction of chemical plants, it has been agreed by the members of the pool that the exploitation of the processes shall be placed in the hands of Lurgi Chemie.

THE RAYON PRODUCERS' SECTION of the Silk Association of Great Britain have put forward a proposal that the Cotton Industry (Reorganisation) Bill, the second reading of which was moved in the House of Commons on Monday, should set up a Rayon Industry Committee, representing rayon producers, weavers, dyers, finishers, merchants, working, along with the Cotton Industry Board, under a Cotton and Rayon Advisory Council. The Bill proposes to put the manufacture and marketing of rayon under the control of a Cotton Industry Board, but the Silk Association ask that it should be recognised as a separate industry.

Books Received

British Plastics Year Book, 1939. London: Plastics Press, Ltd. Pp. 584. 15s.

Spectrographic Analysis in Great Britain. By A. C. Candler. London: Adam Hilger, Ltd. Pp. 80. 7s. 6d.

Chemical and Allied Stocks and Shares

OWING to a widespread tendency to await clarification of the international position the general trend on the Stock Exchange has again been reactionary. There was no very heavy selling pressure in evidence, but markets have been very inactive, and in the absence of improvement in demand, lower prices have ruled.

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With few exceptions securities of chemical and kindred companies reflected the surrounding market tendency and are mostly lower on balance. Exceptionally, Imperial Chemical have improved and are 29s. 9d. at the time of writing, compared with 28s. 10½d. a week ago. The full results are being awaited with considerable interest, particularly as it is expected that for the first time they will include consolidated accounts for the group. Lever and Unilever at 34s. 3d. are within 3d. of the price ruling a week ago, awaiting the dividend announcement. Distillers have declined a few pence, but hopes that the dividend would be maintained possibly prevented a further drop. On the other hand, Turner and Newall have declined from 76s. 3d. to 75s. 7½d., and Associated Cement are 68s. 9d., compared with 70s. a week ago, while Murex have reacted from 75s. 7½d. to 73s. 9d. at the time of writing.

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British Oxygen showed a steadier tendency on satisfaction with the past year's results, and British Aluminium were steady on the favourable impression created by the statements at the meeting. British Plaster Board 5s. shares at 26s. 9d. were within 9d. of the price ruling a week ago, the market having remained hopeful that the dividend may be kept on a 50 per cent. basis.

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Borax Consolidated were little changed at 23s. 6d. and Fison Packard and Prentice at 38s. 6d. were also fairly well maintained. Triplex Glass continued to fluctuate and are 32s. 3d. at the time of writing. The market is assuming that, if the more active conditions reported in the motor car trade continue, the latter company may be able to maintain its dividend. United Glass Bottle ordinary were again 46s. 3d., awaiting the preliminary figures for the past year's working. United Molasses were reactionary and have moved down from 23s. 3d. to 21s. 9d., while Pinchin Johnson declined from 24s. 3d. to 23s. Wall Paper deferred at 31s. 10½d. are virtually unchanged on balance for the week, while Goodlass Wall were again 9s. 1½d. aided by hopes that the forthcoming dividend may be kept at 7 per cent. Imperial Smelting were 9s. 3d. Dunlop Rubber were lower in sympathy with the surrounding trend of markets, although the full results created a good impression and it is being assumed that the dividend and bonus payments would not have been maintained unless it were felt that the outlook for the current year were reasonably promising.

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A fairly steady tendency was shown by the majority of iron and steel shares, although Dorman Long reacted moderately. United Steel at 23s. 4½d. are the same as a week ago. Tube Investments were steadier on the hope that the forthcoming dividend of Stewarts and Lloyds may be increased moderately. Tube Investments, of course, has a financial interest in the latter company. Babcock and Wilcox were fairly steady, awaiting the dividend announcement, which is also due shortly. Firth and John Brown shares were firmer following the statements at the meeting.

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Boots Drug were relatively steady, and are 40s. 6d. at the time of writing, compared with 40s. 9d. a week ago, while Timothy Whites and Taylors are unchanged at 23s. 9d. Sangers declined 6d. and are 20s. 9d. at the time of writing. Leading oil shares moved closely in accordance with the day to day trend of the Stock Exchange.

Inventions in the Chemical Industry

The following information is prepared from the Official Patents Journal. Printed copies of Specifications accepted may be obtained from the Patent Office, 25 Southampton Buildings, London, W.C.2, at 1s. each. The numbers given under "Applications for Patents" are for reference in all correspondence up to the acceptance of the Complete Specification.

Applications for Patents

PRODUCTION OF STEEL of low nitrogen content.—H. A. Brassert and Co., Ltd. (Germany, Aug. 10, '38.) 7722.

VINYL RESIN PLASTIC COMPOSITIONS.—Carbide and Carbon Chemicals Corporation. (United States, April 15, '38.) 7744.

FILLERS FOR VINYL RESIN PLASTICS.—Carbide and Carbon Chemicals Corporation. (United States, April 15, '38.) 8112.

MANUFACTURE OF COMPOUNDS OF THE DIARYL SERIES.—A. Carpmael (I. G. Farbenindustrie.) 7950.

MANUFACTURE OF ETHERS of thioammeline.—A. Carpmael (I. G. Farbenindustrie.) 8346.

RESIN COMPOSITIONS.—Cellomold, Ltd., and D. N. Davies. 7636, 7637.

CONDENSATION PRODUCTS.—Cellomold, Ltd., D. N. Davies, and A. G. Catt-Camfield. 7638.

FORMATION OF CO-PRECIPITATED, ETC., CALCIUM SULPHATE and iron hydroxide.—H. S. Colton. (United States, March 17, '38.) 7644.

MANUFACTURE OF POLYMERISATION PRODUCTS.—J. W. C. Crawford, N. McLeish, and Imperial Chemical Industries, Ltd. 7683.

RESINOUS PRODUCTS.—J. W. C. Crawford, N. McLeish, and Imperial Chemical Industries, Ltd. 7684.

MANUFACTURE OF WATER-SOLUBLE CELLULOSE ETHERS.—W. R. Davis, and Imperial Chemical Industries, Ltd. 8191.

HIGH VACUUM DISTILLATION.—Distillation Products, Inc. (United States, March 9, '38.) 7581.

PREPARATION OF VITAMIN COMPOSITIONS.—Distillation Products, Inc. (United States, March 15, '38.) 8244.

SEPARATION OF BUTADIENE from hydrocarbon mixtures, etc.—Dow Chemical Co. (United States, April 2, '38.) 8231.

PROCESS FOR TREATING MINERAL OIL PRODUCTS containing wax. Edeleanu Ges. (Germany, March 11, '38.) 7786.

PREPARATION OF CELLULOSE XANTHATE SOLUTIONS.—J. P. Fraser. 7759.

PROCESS FOR SACCHARIFYING CELLULOSE, ETC.—M. Giordani and P. Leone. (Italy, March 16, '38.) 8356; (Italy, Dec. 26, '38.) 8357.

DETERGENTS.—R. E. Goldsbrough. 8265.

PRODUCTION OF COPPER free from oxygen.—Heraeus Vacuumschmelze, A.-G. (Germany, April 6, '38.) 8218.

MANUFACTURE OF POLYAZODYESTUFFS.—I. G. Farbenindustrie. (Germany, March 11, '38.) 7870.

MANUFACTURE OF STABLE PHARMACEUTICAL PREPARATIONS.—I. G. Farbenindustrie. (Germany, March 11, '38.) 7871.

DYEING OF MIXED FIBRES.—I. G. Farbenindustrie. (Germany, March 14, '38.) 8034.

CONVERSION OF LOW MOLECULAR WEIGHT HYDROCARBONS having straight, etc., chains.—I. G. Farbenindustrie. (Germany, March 15, '38.) 8189.

PRODUCTS, ETC., FOR STIMULATION OF CELLULAR METABOLISM.—Institutum Divi Thomae Foundation. (United States, April 29, '38.) 7964.

MANUFACTURE OF RESINOUS PRODUCTS.—T. S. Ireland, and Imperial Chemical Industries, Ltd. 7682.

METHOD OF MAKING CHLORINATED RUBBER.—L. Mellersh-Jackson (Hercules Power Co.). 8049.

MANUFACTURE, ETC., OF SUBSTANCES similar to petroleum jelly.—G. W. Johnson (I. G. Farbenindustrie.) 8066.

TREATMENT OF MINERAL MATERIALS with gases.—M. Vogel-Jorgensen. 7685.

MEDICAMENTS.—Kodak, Ltd. (United States, March 11, '38.) 7907.

TREATMENT OF MATERIALS made of an organic derivative of cellulose.—Kodak, Ltd. (United States, March 14, '38.) 8113.

MANUFACTURE OF KETENES, ETC.—Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij. (United States, March 19, '38.) 7839.

PRODUCTION OF BRANCHED, ETC., HYDROCARBONS from non-branched, etc., hydrocarbons.—Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij. (Netherlands, April 1, '38.) 7840.

POLYMERISATION INHIBITORS, ETC.—Norton Grinding Wheel Co., Ltd. (United States, March 14, '38.) 8003.

EXTRACTION OF PRODUCTS from sea water.—Ocean Salts (Products, Ltd., and F. N. Pickett. 7659.

PROCESSES FOR OBTAINING CELLULOSE FOR RAYON from resinous pine woods.—F. C. Palazzo. (Italy, March 16, '38.) 8287.

SILICATE COATING COMPOSITIONS.—R. Plischke, and M. N. du Mont. 7912.

PROCESS FOR THE SYNTHESIS OF HYDROCARBONS from mixtures of carbon monoxide and hydrogen.—H. E. Potts (Naamlooze Vennootschap Internationale Koolwaterstoffen Synthese Maatschappij). 7909.

RUSTPROOFING OF FERROUS SURFACES prior to painting, etc.—S. T. Roberts, and F. Taylor. 8202.

CONVERSION OF ZINC, ETC., SURFACES for ensuring paint, etc., adhesion.—S. T. Roberts, and F. Taylor. 8203.

PRODUCTION OF SULPHUR-CONTAINING CONDENSATION PRODUCTS.—Silesia Verein Chemischer Fabriken. (Germany, March 26, '38.) 7838.

REGENERATION OF CATALYSTS.—Standard Oil Development Co. (United States, Sept. 1, '38.) 8151.

MANUFACTURE OF CATALYSTS, ETC.—Standard Oil Development Co. (United States, May 20, '38.) 8152.

PROCESS FOR DRYING LIQUID MATERIALS.—A. H. Stevens (Borden Co.). 7957.

DESTRUCTIVE DISTILLATION OF CARBONACEOUS MATERIALS.—J. L. Strevens, A. E. Waters, and E. W. Brockelbank. 8348.

PRODUCTION OF MAGNESIUM.—W. J. Tennant (Dow Chemical Co.). 7864.

PREPARATION OF WATER-SOLUBLE CELLULOSE ETHERS.—W. J. Tennant (Dow Chemical Co.). 8070.

MANUFACTURE OF MOTOR FUEL.—Texaco Development Corporation. (United States, March 18, '38.) 7648.

MANUFACTURE OF STEEL from pig-iron.—A. Thyssen-Hütte, A.-G. (Germany, May 13, '38.) 8167.

MANUFACTURE OF THERAPEUTICALLY VALUABLE COMPOUNDS.—W. P. Williams (Schering, A.-G.). (Oct. 27, '38.) 8344.

PROCESS FOR MAKING KERATIN DEGRADATION PRODUCTS containing calcium, etc.—R. von Wulfing, E. Rosskothen, E. Sturm, and R. Fleischmann. 7966.

ISOMERISATION OF NORMAL PARAFFINS.—Anglo-Iranian Oil Co., Ltd., S. F. Birch, and J. H. Beynon. 8443.

PREPARATION OF CHOLESTEROL from materials containing same. Armour and Co. (United States, May 3, '38.) 8989.

BESSEMER PRODUCTION OF STEEL.—H. A. Brassert and Co., Ltd. 8568.

ALLOY.—British Non-Ferrous Metals Research Association, E. A. G. Liddiard, and R. May. 8400.

MEANS FOR USE IN CONNECTION WITH THE ADDITION OF CHEMICAL SOLUTIONS TO WATER.—F. P. Candy. 8430.

PREPARATION OF GAS MIXTURES to be subjected to a catalytic process.—Carbo-Norit-Union Verwaltungs Ges. (Germany, March 23, '38.) 8990.

PRINTING VAT DYESTUFFS.—E. Chapman, A. Davidson, S. T. McQueen, J. Payman, and Imperial Chemical Industries, Ltd. 8837.

POLYMERISATION PRODUCTS.—Combined Optical Industries, Ltd., and A. Wassermann. 9092.

PREPARATION OF PLASTIC MASSES, ETC.—Compagnie Nationale de Matieres Colorantes et Manufactures de Produits Chimiques du Nord Reunies Etablissements Kuhlmann. (France, March 23, '38.) 8660.

ARRANGEMENT FOR EFFECTING REACTIONS between gases, etc.—Comptoir des Textiles Artificiels. (France, March 18, '38.) 8490.

HYDROGENATION OF ADIPONITRILE.—E. I. du Pont de Nemours and Co. (United States, March 17, '38.) 8616.

PURIFICATION OF NITRILES.—E. I. du Pont de Nemours and Co. (United States, March 23, '38.) 8617.

MANUFACTURE OF ALIPHATIC AMINES.—E. I. du Pont de Nemours and Co. (United States, Sept. 28, '38.) 8618.

MANUFACTURE OF A HOMOGENEOUS PLASTIC MATERIAL by impregnation.—G. H. Vulliet-Durand. (France, March 19, '38.) 8835.

PROCESS FOR THE EXTRACTION, ETC., of mineral oils.—Edeleanu Ges. (Germany, March 22, '38.) 8537.

PROCESS FOR DYEING WOOL, ETC.—A. E. Everest, and J. A. Wallwork. 8483.

DETERGENTS, ETC.—W. Franklin. 8663.

RECOVERY OF SALTS from solution used for gas purification.—Gas Light and Coke Co., W. K. Hutchison, G. U. Hopton, and I. G. C. Dryden. 8598.

FUEL GASES.—A. J. Hailwood, and Imperial Chemical Industries, Ltd. 8615.

MANUFACTURE OF DL-TOCOPHEROLS.—F. Hoffman-La Roche and Co., A.-G. (Switzerland, March 31, '38.) 8628; (Switzerland, April 1, '38.) 8629; (Switzerland, April 14, '38.) 8630; (Switzerland, June 3, '38.) 8631; (Switzerland, June 11, '38.) 8632; (Switzerland, June 23, '38.) 8633; (Switzerland, July 20, '38.) 8634; (Switzerland, July 26, '38.) 8635.

MANUFACTURE OF CONDENSATION PRODUCTS from trimethyl-hydroquinone.—F. Hoffman-La Roche and Co. (Switzerland, March 18, '38.) 9708; (Switzerland, March 22, '38.) 8709.

DISAZO DYESTUFFS.—G. F. Howard, A. H. Knight, and Imperial Chemical Industries, Ltd. 9093.

PROCESS FOR WATER-REPELLENT FINISHING TEXTILE MATERIALS.—I. G. Farbenindustrie. (Germany, March 22, '38.) 8802.

PRODUCTION OF BLACK-BLUE LACQUER DYESTUFFS.—I. G. Farbenindustrie. (Germany, March 31, '38.) 8963.

PROCESS FOR DIMINISHING, ETC., FOAMING.—I. G. Farbenindustrie. (Germany, March 25, '38.) 9061.

MANUFACTURE, ETC., OF DYESTUFFS, ETC., containing a cyclopentadiene grouping.—J. D. Kendall. 8985.

DYESTUFFS FOR SENSITISING PHOTOGRAPHIC EMULSIONS.—J. D. Kendall. 8986, 8987.

MANUFACTURE OF INDUSTRIAL GASES.—K. Koller, and Z. Galocsy. 8913.

PREPARATION OF THE HYDROXYLATED DERIVATIVES of γ, 5-diphenyl-n-hexane.—Laboratoires Francais de Chimiotherapie, A. Girard, and G. Sandulesco. (France, Feb. 8.) 8401.

PRODUCTION OF OXIDIC PROTECTIVE LAYERS on magnesium, etc. Langbein Pfanhauser-Werke, A.-G. (Germany, March 22, '38.) 8753.

METHOD OF PRODUCING NEUTRONS.—Licentia Patent-Verwaltungs-Ges. (Germany, March 16, '38.) 8487.

PRODUCTION OF INTER-POLYMERISATION PRODUCTS of tertiary, etc., olefines.—Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij. (March 23, '38.) (United States, March 26, '37.) 8484.

PRODUCTION OF ISOBUTANE from normal butane.—Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij. (Aug. 4, '38.) (Netherlands, Aug. 18, '37.) 8847.

METHOD OF RENDERING PAINT, ETC., FIREPROOF.—J. H. C. Penners. (Netherlands, March 16, '38.) 8421.

SYNTHETIC PRODUCTION OF ETHYL ALCOHOL.—P. G. M. A. Pigache. 8376.

TREATMENT OF STARCH-CONVERTED SOLUTIONS.—J. E. Pollak (Corn Products Refining Co.). 9102.

ELECTROLYTIC PRODUCTION OF MANGANESE.—H. E. Potts (Atack). 8897.

CONVERSION OF CARBONMONOXIDE with hydrogen into hydrocarbons.—H. E. Potts (Atack) (Naamlooze Vennootschap Internationale Koolwaterstoffen Synthese Maatschappij.) 8508.

PROCESS FOR RETARDING, ETC., THE PERISHING OF MATERIALS, ETC., consisting of organic substances by the action of bacteria, etc.—A. Romwalter, A. Kiraly, G. Fai, and M. Racz. (Hungary, Aug. 2, '38.) 8996.

MANUFACTURE OF KETONES of the cyclopentano-polyhydrophenanthrene series.—Schering, A.-G. (Germany, April 21, '38.) 8612; (Germany, June 18, '38.) 8613; (Germany, Feb. 6.) 8614.

WORKING UP OF RUBBER-LIKE SULPHUR-CONTAINING ORGANIC CONDENSATION PRODUCTS.—Silesia Verein Chemischer Fabriken. (Germany, March 31, '38.) 8848.

MANUFACTURE OF POLYSTYRENES.—Soc. des Usines Chimiques Rhone-Poulenc, E. Bachmann, and J. E. Band. 8967.

PROCESS FOR RENDERING RUBBER FIRE-PROOF.—Soc. des Usines Chimiques Rhone-Poulenc, E. Bachmann, and J. E. Band. (France, Feb. 17.) 8868.

MANUFACTURE OF STABILISED PREPARATIONS OF SULPHURIC ANHYDRIDE.—Soc. Rhodiaceta. (France, March 21, '38.) 8831.

MANUFACTURE OF SUGAR DERIVATIVES of non-steroids having the effect of steroid hormones.—Soc. of Chemical Industry in Basle. (Switzerland, March 16, '38.) 8415; (Switzerland, Jan. 24.) 8416.

Complete Specifications Open to Public Inspection

RECOVERY OF GLYCEROL.—National Maize Products, Ltd. Sept. 15, 1937. 10841/38.

SOLVENT EXTRACTION OF NAPHTHENIC OILS.—Standard Oil Development Co. Sept. 16, 1937. 10927/38.

MANUFACTURE OF 1-AMINO-2-CHLORO (or bromo)-4 (or 6)-nitrobenzene-6 (or 4)-sulphonic acid.—I. G. Farbenindustrie. Sept. 17, 1937. 22943/38.

PROCESS OF WORKING UP AMMONIACAL SOLUTIONS of heavy metals. I. G. Farbenindustrie. Sept. 14, 1937. 23593/38.

DEALKYLATION OF ALKYL SUBSTITUTED PHENOLS.—Bakelite, Ltd. Sept. 14, 1937. 25430/38.

MANUFACTURE OF ANHYDROUS MAGNESIUM OXYCHLORIDE or chlorine and/or hydrochloric acid from magnesium chloride.—A. Hausdorff. Sept. 14, 1937. 26169/38.

PRODUCTION OF NITRITE ESTERS of non-phenolic organic compounds.—Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij. Sept. 17, 1937. 26193/38.

PRODUCTION OF ALLYL-TYPE HALOGEN-CONTAINING DERIVATIVES of propene.—Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij. Sept. 14, 1937. **26194/38.**

MANUFACTURE OF LUBRICATING OILS.—Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij. Sept. 18, 1937. 26413/38.

PREPARATION OF POLYAZO DYESTUFFS, of lacquers derived therefrom, and industrial products resulting therefrom.—Compagnie Nationale de Matieres Colorantes et Manufactureres de Produits Chimiques du Nord Reunis Etablissements Kuhlmann. Sept. 14, 1937. 26763/38.

MANUFACTURE OF DERIVATIVES OF FLUORANTHENE.—Soc. of Chemical Industry in Basle. Sept. 14, 1937. 26802/38.

MANUFACTURE OF NITROGENOUS CONDENSATION PRODUCTS of fluoranthene.—Soc. of Chemical Industry in Basle. Sept. 14, 1937. 26807/38.

MANUFACTURE OF COMPOUNDS of the cyclopentanopolyhydrophenanthrene series.—Schering, A.-G. Sept. 18, 1937. 26850/38.

MANUFACTURE OF ADHESIVE BITUMENS.—Standard Oil Development Co. Sept. 15, 1937. 26934/38; Sept. 15, 1937. 26936/38.

MANUFACTURE OF CARBAZOLE COMPOUNDS.—I. G. Farbenindustrie. Sept. 15, 1937. 26973/38.

MANUFACTURE OF WETTING AND EMULSIFYING AGENTS.—Bohme Fettchemie, Ges. Sept. 17, 1937. **26983/38.**

REFINING HYDROCARBONS.—Gutehoffnungshutte Oberhausen, A.-G. Sept. 16, 1937. 27052/38.

MANUFACTURE OF ANHYDROUS BERYLLIUM FLUORIDE free from oxide.—Seri Holding Soc. Anon. Sept. 18, 1937. 27123/38.

MANUFACTURE OF ORGANIC MERCURY COMPOUNDS.—Fahlberg-List, A.-G. Chemische Fabriken. Sept. 17, 1937. 27259/38.

WORKING UP POLYVINYLACETALS.—Deutsche Celluloid-Fabrik, A.-G. Sept. 17, 1937. 27260/38.

POLYMERISING OLEFINES.—Gutehoffnungshutte Oberhausen, A.-G. Sept. 20, 1937. 27378/38.

CONSTRUCTION OF STRUCTURES resistant to the action of acids and solvents.—I. G. Farbenindustrie. Sept. 20, 1937. 27405/38.

MANUFACTURING OF NAPHTHALENE DERIVATIVES.—Schering, A.-G. Sept. 20, 1937. 27445/38.

PROCESS FOR PRODUCING INTER-POLYMERISATION PRODUCTS of tertiary and secondary olefines.—Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij. March 26, 1937. 8484/38.

PROCESS FOR PRODUCING ISOBUTANE from normal butane.—Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij. Aug. 18, 1937. 8847/38.

Specifications Accepted with Date of Application

MANUFACTURE OF COMPOUNDS of the cyclopentanopolyhydrophenanthrene series.—W. W. Groves (I. G. Farbenindustrie.) July 15, 1937. (Samples furnished.) 502,474.

CATALYTIC POLYMERISATION OF OLEFINES.—G. W. Johnson (I. G. Farbenindustrie.) July 15, 1937. 502,475.

PROCESS FOR THE MANUFACTURE OF CYCLIC SULPHONIC ACID AMIDE COMPOUNDS.—A. Carpmael (I. G. Farbenindustrie.) Aug. 10, 1937. 502,173.

FIBROUS MATERIALS impregnated with plastic materials, and moulded products prepared therefrom.—C. D. Philippe, and Bakelite, Ltd. Sept. 11, 1937. 502,409.

PRODUCING INDIGO DYEINGS.—W. W. Groves (I. G. Farbenindustrie.) Sept. 13, 1937. 502,412.

MANUFACTURE OF ESTERS.—W. W. Groves (I. G. Farbenindustrie.) Sept. 15, 1937. (Samples furnished.) 502,375.

MANUFACTURE OF AZO DYESTUFFS.—W. H. Cliffe, and Imperial Chemical Industries, Ltd. Sept. 16, 1937. 502,420.

REACTING CARBON MONOXIDE with hydrogen.—G. W. Johnson (I. G. Farbenindustrie.) Sept. 20, 1937. 502,542.

COMPOSITIONS FOR REMOVING STAINS, and processes of manufacturing the same.—L. C. Schilling. Aug. 18, 1937. 502,427.

PURIFICATION OF WASTE AQUEOUS LIQUIDS containing phenol.—G. W. Johnson (I. G. Farbenindustrie.) Oct. 15, 1937. 502,193.

MANUFACTURE AND PRODUCTION OF LEAD DIOXIDE.—G. W. Johnson (I. G. Farbenindustrie.) Oct. 20, 1937. 502,194.

TREATMENT OF BAUXITE RESIDUES.—A. P. Laurie. Nov. 27, 1937. 502,376.

PREPARING A TETRAHYDRONAPHTHALENE DERIVATIVE.—Y. Asahina. March 14, 1938. 502,214.

PREPARING DERIVATIVES OF TETRAHYDRONAPHTHYLQUINOL.—Y. Asahina. March 14, 1938. 502,215.

SATURATED AND UNSATURATED DERIVATIVES OF PREGNANE DIONE and the manufacture thereof.—Naamlooze Vennootschap Organon. March 24, 1937. 502,289.

PRODUCTION OF POLYHYDROXYFUCHSONE DERIVATIVES.—Chinoin Gyogyszer es Vegyeszeti Termekek Gyara R. T. (Dr. Kereszty and Dr. Wolf). March 26, 1937. 502,216.

MANUFACTURE OF DERIVATIVES of pregnenedione.—Naamlooze Vennootschap Organon. March 29, 1937. 502,439.

BITUMINOUS COMPOSITIONS.—W. Kirchner. April 12, 1938. 502,294.

MANUFACTURE OF QUATERNARY AMMONIUM COMPOUNDS.—Soc. of Chemical Industry in Basle. April 20, 1937. 502,517.

REMOVAL OF MERCAPTANS from hydrocarbons or derivatives thereof.—Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij. May 26, 1937. 502,448.

PROCESS FOR THE MANUFACTURE OF AN ALDOL CONDENSATION PRODUCT from carbonyl compounds.—Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij. June 12, 1937. 502,450.

FIREPROOFING COMPOSITIONS.—W. Herz. June 3, 1938. 502,307.

PREPARATION OF COATING COMPOSITIONS.—Beck, Koller, and Co. (England), Ltd. June 10, 1937. 502,308.

TREATMENT OF FIBROUS ORGANIC MATERIALS.—C. Ruzicka, and C. V. Sale. June 9, 1938. 502,451.

MANUFACTURE OF AZO DYESTUFFS.—I. G. Farbenindustrie. June 9, 1937. (Sample furnished.) 502,523.

MANUFACTURE OF AZO DYESTUFFS.—J. R. Geigy, A.-G. June 14, 1937. 502,309.

ISOMERISING FATTY OILS AND FATS.—Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij. May 12, 1938. 502,390.

BLACK DYEING OF FABRICS.—Soc. Rhodiaceta. July 7, 1937. 502,454.

PREPARATION OF ALKALI PERCARBONATES.—Deutsche Gold- und Silber-Scheideanstalt Vorm Roessler. July 1, 1937. 502,319.

CONTINUOUS PURIFICATION OF CARBON DISULPHIDE.—I. G. Farbenindustrie. Nov. 27, 1937. 502,332.

PROGRESSIVE PURIFICATION OF BIOLOGICALLY IMPURE LIQUIDS.—C. J. Dekema. July 30, 1938. 502,530.

CONCENTRATION OF RUBBER LATEX.—L. Mellersh-Jackson (United States Rubber Co.). Dec. 8, 1938. 502,470.

MANUFACTURE AND PRODUCTION OF GLYCIDE NITRATE.—I. G. Farbenindustrie. Dec. 30, 1937. 502,471.

Weekly Prices of British Chemical Products

CONDITIONS throughout the chemical markets are a little brighter this week, most sections of the market reporting an improved demand. Deliveries under existing contracts have been on a satisfactory scale and a good volume of inquiry for new contract business covering deliveries over the next six months has been an encouraging feature. Acetic, tartaric and citric acids are items enjoying a seasonal business and the majority of the potash and soda compounds are moving along steady lines. Prices on the whole are steady with a firm undertone, there being no important alteration in quotations to report. Trade in coal tar products has been somewhat subdued, the process of recovery in this market being hindered by the unsettled European situation. The price position shows very little alteration and quotations are nominal.

Price Changes

Falls: Naphthalene, refined (Manchester); Calcium Acetate, brown and grey (Manchester).

MANCHESTER.—Confidence of markets has been upset again by the renewed political uncertainty and fresh business on the Manchester chemical market during the past week has been on no more than quiet lines so far as the leading heavy products are concerned. However, there is still a fair flow of delivery specifications against existing contracts and from this point of view the position appears to be no worse than it has been during the past few weeks. Prices generally remain on a steady basis, although there is an easy tendency in some of the by-products, buying interest in which is largely confined to the lighter distillates.

GLASGOW.—Business in general chemicals for home trade has been quieter during the past week, and export business also has been very limited. Prices, however, remain quite steady at about previous figures, with no important changes to report.

General Chemicals

ACETONE.—£39 to £43 per ton, according to quantity.

ACETIC ACID.—Tech, 80%, £30 5s. per ton; pure 80%, £32 5s.; tech., 40%, £15 12s. 6d. to £18 12s. 6d.; tech., 60%, £23 10s. to £25 10s. MANCHESTER: 80%, commercial, £30 5s.; tech. glacial, £42 to £46.

ALUM.—Loose lump, £8 7s. 6d. per ton d/d; GLASGOW: Ground, £10 7s. 6d. per ton; lump, £9 17s. 6d.

ALUMINIUM SULPHATE.—£7 5s. 0d. per ton d/d Lancs. GLASGOW: £7 to £8 ex store.

AMMONIA, ANHYDROUS.—Spot, 1s. to 1s. 1d. per lb. d/d in cylinders. SCOTLAND: 10½d. to 1s. 0½d., containers extra and returnable.

AMMONIA, LIQUID.—SCOTLAND: 80°, 2½d. to 3d. per lb., d/d.

AMMONIUM CARBONATE.—£20 per ton d/d in 5 cwt. casks

AMMONIUM CHLORIDE.—Grey, £17 10s. per ton, d/d U.K. Fine white, 98%, £16 per ton, d/d U.K.

AMMONIUM CHLORIDE (MURIATE).—SCOTLAND: British dog tooth crystals, £32 to £35 per ton carriage paid according to quantity. (See also Salammoniac.)

AMMONIUM DICHROMATE.—8½d. per lb. d/d U.K.

ANTIMONY OXIDE.—£68 per ton.

ARSENIC.—Continental material £11 per ton c.i.f., U.K. ports; Cornish White, £12 5s. to £12 10s. per ton f.o.r., mines, according to quantity. MANCHESTER: White powdered Cornish, £16 per ton, ex store.

BARIUM CHLORIDE.—£11 10s. to £12 10s. per ton in casks ex store. GLASGOW: £12 per ton.

BLEACHING POWDER.—Spot, 35/37%, £9 5s. per ton in casks, special terms for contract. SCOTLAND: £9 5s. per ton net ex store.

BORAX COMMERCIAL.—Granulated, £16 per ton; crystal, £17; powdered, £17 10s.; extra finely powdered, £18 10s., packed in 1-cwt. bags, carriage paid home to buyers' premises within the United Kingdom in 1-ton lots. GLASGOW: Granulated, £16, crystal, £17; powdered, £17 10s. per ton in 1-cwt. bags, carriage paid.

BORIC ACID.—Commercial granulated, £28 10s. per ton; crystal, £29 10s.; powdered, £30 10s.; extra finely powdered, £32 10s. in 1-cwt. bags, carriage paid home to buyers' premises within the United Kingdom in 1-ton lots. GLASGOW: Crystals, £29 10s.; powdered, £30 10s. 1-cwt. bags in 1-ton lots.

CALCIUM BISULPHITE.—£6 10s. per ton f.o.r. London.

CHARCOAL, LUMP.—£6 to £6 10s. per ton, ex wharf. Granulated, £7 to £9 per ton according to grade and locality.

CHLORINE, LIQUID.—£18 15s. per ton, seller's tank wagons, carriage paid to buyer's sidings; £19 5s. per ton, d/d in 16/17 cwt. drums (3-drum lots); £19 10s. per ton d/d in 10-cwt. drums (4-drum lots); 4⅝d. per lb. d/d station in single 70-lb. cylinders.

CHROMETAN.—Crystals, 2⅝d. per lb.; liquor, £13 per ton d/d station in drums. GLASGOW: 70/75% solid, £5 15s. per ton net ex store.

CHROMIC ACID.—9d. per lb., less 2½%; d/d U.K.

CHROMIC OXIDE.—11¼d. per lb.; d/d U.K.

CITRIC ACID.—1s. 0¼d. per lb. MANCHESTER: 1s. 0¼d. SCOTLAND: B.P. crystals, 1s. 0¼d. per lb.; less 5%, ex store.

COPPER SULPHATE.—£18 5s. per ton, less 2% in casks. MANCHESTER: £19 2s. 6d. per ton f.o.b. SCOTLAND: £19 10s. per ton, less 5%, Liverpool in casks.

CREAM OF TARTAR.—100%, 92s. per cwt., less 2½%. GLASGOW: 99%, £4 12s. per cwt. in 5-cwt. casks.

FORMALDEHYDE.—£20-£22 per ton.

FORMIC ACID.—85%, in carboys, ton lots, £42 to £47 per ton.

GLYCERINE.—Chemically pure, double distilled, 1.260 s.g., in tins, £3 10s. to £4 10s. per cwt. according to quantity; in drums, £3 2s. 6d. to £3 16s. 0d. Refined pale straw industrial, 5s. per cwt. less than chemically pure.

HYDROCHLORIC ACID.—Spot, 5s. 6d. to 8s. carboy d/d according to purity, strength and locality.

IODINE.—Resublimed B.P., 6s. 9d. per lb. in 7 lb. lots.

LACTIC ACID.—(Not less than ton lots). Dark tech., 50% by vol., £24 10s. per ton; 50% by weight, £28 10s.; 80% by weight, £50; pale tech., 50% by vol., £28; 50% by weight, £33; 80% by weight, £55; edible, 50%, by vol., £41. One-ton lots ex works, barrels free.

LEAD ACETATE.—LONDON: White, £31 10s. ton lots; brown, £35. GLASGOW: White crystals, £29 10s.; brown, £1 per ton less. MANCHESTER: White, £31; brown, £30.

LEAD, NITRATE.—£32 per ton for 1-ton lots.

LEAD, RED.—£30 15s. 0d. 10 cwt. to 1 ton, less 2½% carriage paid. SCOTLAND: £30 per ton, less 2½% carriage paid for 2-ton lots.

LITHARGE.—SCOTLAND: Ground, £30 per ton, less 2½ %, carriage paid for 2-ton lots.

MAGNESITE.—Calcined, in bags, ex works, about £8 per ton. SCOTLAND: Ground calcined, £9 per ton, ex store.

MAGNESIUM CHLORIDE.—Solid (ex wharf) £5 10s. per ton. SCOTLAND: £7 5s. per ton.

MAGNESIUM SULPHATE.—Commercial, £5 10s. per ton, ex wharf.

MERCURY.—Ammoniated B.P. (white precip.), lump, 6s. 5d. per lb.; powder B.P., 6s. 7d.; bichloride B.P. (corros. sub.), 5s. 8d.; powder B.P. 5s. 4d.; chloride B.P. (calomel), 6s. 5d.; red oxide cryst. (red precip.), 7s. 6d.; levig., 7s.; yellow oxide B.P. 6s. 10d.; persulphate white B.P.C., 6s. 7d.; sulphide black (hyd. sulph. cum. sulph. 50%), 6s. 6d. For quantities under 112 lb., 1d. extra; under 28 lb., 5d. extra.

METHYLATED SPIRIT.—61 O.P. industrial, 1s. 5d. to 2s. per gal.; pyridinised industrial, 1s. 7d. to 2s. 2d.; mineralised, 2s. 6d. to 3s. Spirit 64 O.P. is 1d. more in all cases and the range of prices is according to quantities. SCOTLAND: Industrial 64 O.P., 1s. 9d. to 2s. 4d.

NITRIC ACID.—Spot, £25 to £30 per ton according to strength, quantity and destination.

OXALIC ACID.—£48 15s. to £57 10s. per ton, according to packages and position. GLASGOW: £2 9s. per cwt. in casks. MANCHESTER: £49 to £55 per ton ex store.

PARAFFIN WAX.—SCOTLAND: 3½d. per lb.

POTASH, CAUSTIC.—Solid, £33 5s. to £38 per ton according to quantity, ex store; broken, £40 per ton. MANCHESTER: £38.

POTASSIUM CHLORATE.—£36 7s. 6d. per ton. GLASGOW: 4½d. per lb. MANCHESTER: £37 per ton.

POTASSIUM DICHROMATE.—5½d. per lb. carriage paid. SCOTLAND: 5½d. per lb., net, carriage paid.

POTASSIUM IODIDE.—B.P. 6s. 3d. per lb. in 7 lb. lots.

POTASSIUM NITRATE.—Small granular crystals, £24 to £27 per ton ex store, according to quantity. GLASGOW: Refined granulated, £29 per ton c.i.f. U.K. ports. Spot, £30 per ton ex store.

POTASSIUM PERMANGANATE.—LONDON: 9½d. to 10½d. per lb. SCOTLAND: B.P. Crystals, 10½d. MANCHESTER: B.P. 9½d. to 11½d.

POTASSIUM PRUSSIATE.—5½d. to 6d. per lb. SCOTLAND: 6½d. net, in casks, ex store. MANCHESTER: Yellow, 6d. to 6½d.

PRUSSIATE OF POTASH CRYSTALS.—In casks, 6½d. per lb. net, ex store

SALAMMONIAC.—Firsts lump, spot, £42 17s. 6d. per ton, d/d address in barrels. Dog-tooth crystals, £35 per ton; fine white crystals, £18 per ton, in casks, ex store. GLASGOW: Large crystals, in casks, £37 10s.

SALT CAKE.—Unground, spot, £3 8s. 6d. per ton.

SODA ASH.—Light 98/100%, £5 17s. 6d. per ton f.o.r. in bags.

SODA, CAUSTIC.—Solid, 76/77° spot, 13s. 10s. per ton d/d station. SCOTLAND: Powdered 98/99%, £18 10s. in drums, £19 5s. in casks, Solid 76/77° £15 12s. 6d. in drums; 70/73%, £15 12s. 6d., carriage paid buyer's station, minimum 4-ton lots; contracts, 10s. per ton less.

SODA CRYSTALS.—Spot, £5 to £5 5s. per ton d/d station or ex depot in 2-cwt. bags.

SODIUM ACETATE.—£19-£20 per ton carriage paid North. GLASGOW: £18 10s. per ton net ex store.

SODIUM BICARBONATE.—Refined spot, £10 10s. per ton d/d station in bags in 1-ton lots. GLASGOW: £13 5s. per ton in 1 cwt. kegs, £11 5s. per ton in 2-cwt. bags. MANCHESTER: £10 15s.

SODIUM BISULPHITE POWDER.—60/62%, £12 10s. to £14 per ton d/d in 2-ton lots for home trade.

SODIUM CARBONATE MONOHYDRATE.—£20 per ton d/d in minimum ton lots in 2 cwt. free bags.

SODIUM CHLORATE.—£27 10s. to £32 per ton. GLASGOW: £1 11s. per cwt., minimum 3 cwt. lots.

SODIUM DICHROMATE.—Crystals cake and powder 4½d. per lb. net d/d U.K. with rebates for contracts.

SODIUM CHROMATE.—4½d. per lb. d/d U.K.
4d. per lb. GLASGOW: 4½d. net, carriage paid.

SODIUM HYPOSULPHITE.—Pea crystals, £15 5s. per ton for 2-ton lots; commercial, £11 5s. per ton. MANCHESTER: Commercial, £11; photographic, £15 10s.

SODIUM METASILICATE.—£14 5s. per ton, d/d U.K. in cwt. bags.

SODIUM NITRATE.—Refined, £8 per ton for 6-ton lots d/d. GLASGOW: £1 12s. 0d. per cwt. in 1-cwt kegs, net, ex store.

SODIUM NITRITE.—£18 5s. per ton for ton lots.

SODIUM PERBORATE.—10%, £4 per cwt. d/d in 1-cwt. drums.

SODIUM PHOSPHATE.—Di-sodium, £12 per ton delivered for ton lots. Tri-sodium, £16 10s. per ton delivered per ton lots.

SODIUM PRUSSIATE.—4d. per lb. for ton lots. GLASGOW: 4d. MANCHESTER: 4¼d. to 5d.

SODIUM SILICATE.—£8 2s. 6d. per ton.

SODIUM SULPHATE (GLAUBER SALTS).—£3 per ton d/d.

SODIUM SULPHATE (SALT CAKE).—Unground spot, £3 to £3 10s. per ton d/d station in bulk. SCOTLAND: Ground quality, £3 5s. per ton d/d. MANCHESTER: £3 10s.

SODIUM SULPHIDE.—Solid 60/62%, Spot, £11 15s. per ton d/d in drums; crystals, 30/32%, £9 per ton d/d in casks. MANCHESTER: Concentrated solid, 60/62%, £11; commercial, £8 10s.

SODIUM SULPHITE.—Pea crystals, spot, £14 10s. per ton d/d station in kegs.

SULPHUR PRECIP.—B.P., £55 to £60 per ton according to quantity. Commercial, £50 to £55.

SULPHURIC ACID.—168° Tw., £4 11s. to £5 1s. per ton; 140° Tw., arsenic-free, £3 to £3 10s.; 140° Tw., arsenious, £2 10s.

TARTARIC ACID.—1s. 1¼d. per lb. less 5%, carriage paid for lots of 5 cwt. and upwards. MANCHESTER: 1s. 1¼d. per lb. GLASGOW: 1s. 1¾d. per lb., 5%, ex store.

ZINC SULPHATE.—Tech., £11 10s. f.o.r., in 2 cwt. bags.

Rubber Chemicals

ANTIMONY SULPHIDE.—Golden, 7d. to 1s. 2d. per lb., according to quality. Crimson, 1s. 6d. to 1s. 7½d. per lb.

ARSENIC SULPHIDE.—Yellow, 1s. 5d. to 1s. 7d. per lb.

BARYTES.—£6 to £6 10s. per ton, according to quality.

CADMIUM SULPHIDE.—3s. 0d. to 3s. 3d. per lb.

CARBON BLACK.—3⅝d. to 4 1/16d. per lb., ex store.

CARBON DISULPHIDE.—£31 to £33 per ton, according to quantity, drums extra.

CARBON TETRACHLORIDE.—£41 to £46 per ton, according to quantity, drums extra.

CHROMIUM OXIDE.—Green, 10½d. to 11½d. per lb.

DIPHENYLGUANIDINE.—2s. 2d. per lb.

INDIA-RUBBER SUBSTITUTES.—White, 4¼d. to 5d. per lb.; dark 3⅝d. to 4⅜d. per lb.

LAMP BLACK.—£24 to £26 per ton del., according to quantity. Vegetable black, £35 per ton upwards.

LEAD HYPOSULPHITE.—9d. per lb.

LITHOPONE.—Spot, 30%, £16 10s. per ton, 2-ton lots d/d in bags.

SULPHUR.—£9 to £9 5s. per ton. SULPHUR PRECIP. B.P., £55 to £60 per ton. SULPHUR PRECIP. COMM., £50 to £55 per ton.

SULPHUR CHLORIDE.—5d. to 7d. per lb., according to quantity.

VERMILION.—Pale, or deep, 5s. per lb., 1-cwt. lots.

ZINC SULPHIDE.—£58 to £60 per ton in casks ex store, smaller quantities up to 1s. per lb.

Nitrogen Fertilisers

AMMONIUM SULPHATE.—The following prices have been announced for neutral quality basis 20.6% nitrogen, in 6-ton lots delivered farmer's nearest station up to June 30, 1939; November, £7 8s.; December, £7 9s. 6d.; January, 1939; £7 11s.; February, £7 12s. 6d.; March/June, £7 14s.

CALCIUM CYANAMIDE.—The following prices are for delivery in 5-ton lots, carriage paid to any railway station in Great Britain up to June 30, 1939; November, £7 12s. 6d.; December, £7 13s. 9d.; January, 1939, £7 15s.; February, £7 16s. 3d.; March, £7 17s. 6d.; April/June, £7 18s. 9d.

NITRO CHALK.—£7 10s. 6d. per ton up to June 30, 1939.

SODIUM NITRATE.—£8 per ton for delivery up to June 30, 1939.

CONCENTRATED COMPLETE FERTILISERS.—£11 4s. to £11 13s. per ton in 6-ton lots to farmer's nearest station.

AMMONIUM PHOSPHATE FERTILISERS.—£10 19s. 6d. to £14 16s. 6d. per ton in 6-ton lots to farmer's nearest station.

Coal Tar Products

BENZOL.—At works, crude, 9½d. to 10d. per gal.; standard motor, 1s. 3½d. to 1s. 4d.; 90%, 1s. 4½d. to 1s. 5d., pure 1s. 8½d. to 1s. 9d. GLASGOW: Crude, 10d. to 10½d. per gal.; motor, 1s. 4d. to 1s. 4½d. MANCHESTER: Pure, 1s. 8d. to 1s. 8½d. per gal.; crude 11d. to 11½d. per gal.

CARBOLIC ACID.—Crystals, 6⅝d. to 7⅛d. per lb., small quantities would be dearer; Crude, 60's, 1s. 7½d. to 1s. 10d.; dehydrated, 2s. 6d. per gal., according to specification; Pale, 99/100%, per lb. f.o.b. in drums; crude, 2s. 1d. per gal.

CREOSOTE.—Home trade, 3½d. to 4d. per gal., f.o.r., makers' works; exports 6d. to 6¼d. per gal., according to grade. MANCHESTER: 3d. to 3⅜d. GLASGOW: B.S.I. Specification, 6d. to 6¼d. per gal.; washed oil, 5d. to 5½d.; lower sp. gr. oils, 5⅜d. to 6¼d.

CRESYLIC ACID.—97/99%, 1s. 4d. to 1s. 7d.; 99/100%, 1s. 9d. to 2s. 6d. per gal., according to specifications; Pale, 99/100%, 1s. 6d. to 1s. 8d.; Dark, 95%, 1s. 2d. to 1s. 4d. per gal. GLASGOW: Pale, 99/100%, 5s. to 5s. 6d. per gal.; pale, 97/99%, 4s. 6d. to 4s. 10d., dark, 97/99%, 4s. 3d. to 4s. 6d.; high boiling acids, 2s. to 2s. 6d. American specification, 3s. 9d. to 4s. MANCHESTER: Pale, 99/100%, 1s. 9d. to 1s. 10d.

NAPHTHA.—Solvent, 90/160, 1s. 6d. to 1s. 7d. per gal.; solvent, 95/160%, 1s. 7d. to 1s. 8d., naked at works; heavy 90/190%, 1s. 1½d. to 1s. 3d. per gal., naked at works, according to quantity. MANCHESTER: 90/160%, 1s. 5d. to 1s. 7d. per gal. GLASGOW: Crude, 6½d. to 7½d. per gal.; 90%, 160, 1s. 5d. to 1s. 6d., 90%, 190, 1s. 1d. to 1s. 3d.

NAPHTHALENE.—Crude, whizzed or hot pressed, £4 10s. to £5 10s. per ton; purified crystals, £9 10s. per ton in 2-cwt. bags. LONDON: Fire lighter quality, £3 to £4 10s. per ton. GLASGOW: Fire lighter, crude, £6 to £7 per ton (bags free). MANCHESTER: Refined, £10 10s. to £11 10s. per ton f.o.b.

PITCH.—Medium, soft, 30s. per ton, f.o.b. MANCHESTER: 26s. f.o.b., East Coast. GLASGOW: f.o.b. Glasgow, 35s. to 37s. per ton; in bulk for home trade, 35s.

PYRIDINE.—90/140%, 12s. 6d. to 14s. per gal.; 90/160%, 10s. 6d. to 11s. 6d. per gal.; 90/180%, 3s. to 4s. per gal. f.o.b. GLASGOW: 90% 140, 10s. to 12s. per gal.; 90% 160, 9s. to 10s.; 90% 180, 2s. 6d. to 3s. MANCHESTER: 11s. to 13s. per gallon.

TOLUOL.—90%, 1s. 11d. to 2s. per gal; pure 2s. 3d. to 2s. 4d. GLASGOW: 90% 120, 1s. 10d. to 2s. 1d. per gal. MANCHESTER: Pure, 2s. 4d. per gallon, naked.

XYLOL.—Commercial, 2s. 2d. per gal.; pure, 2s. 4d. GLASGOW: Commercial, 2s. to 2s. 1d. per gal.

Wood Distillation Products

CALCIUM ACETATE.—Brown, £6 15s. to £9 5s. per ton; grey, £8 to £8 5s. MANCHESTER: Brown, £8; grey, £9 10s.

METHYL ACETONE.—40.50%, £32 to £35 per ton.

WOOD CREOSOTE.—Unrefined, 6d. to 8d. per gal., according to boiling range.

WOOD NAPHTHA, MISCIBLE.—2s. 8d. to 3s. per gal.; solvent, 3s. to 3s. 5d. per gal.

WOOD TAR.—£3 to £8 per ton, according to quality.

Intermediates and Dyes

ANILINE OIL.—Spot, 8d. per lb., drums extra, d/d buyer's works.

ANILINE SALTS.—Spot, 8d. per lb. d/d buyer's works, casks free.

BENZIDINE, HCl.—2s. 7½d. per lb., 100% as base, in casks.

BENZOIC ACID, 1914 B.P. (ex toluol).—1s. 11½d. per lb. d/d buyer's works.

m-CRESOL 98/100%.—1s. 8d. to 1s. 9d. per lb. in ton lots.

o-CRESOL 30/31° C.—6½d to 7½d. per lb. in 1-ton lots.

p-CRESOL, 34-5° C.—1s. 7d. to 1s. 8d. per lb. in ton lots.

DICHLORANILINE.—2s. 1½d. to 2s. 5½d. per lb.

DIMETHYLANILINE.—Spot, 1s. 7½d. per lb., package extra.

DINITROBENZENE.—7½d. per lb.

DINITROCHLORBENZENE, SOLID.—£79 5s. per ton.

DINITROTOLUENE.—48/50° C., 8½d. per lb.; 66/68° C., 11d.

DIPHENYLAMINE.—Spot, 2s. 2d. per lb.. d/d buyer's works.

GAMMA ACID, Spot, 4s. 4½d. per lb. 100% d/d buyer's works.

H ACID.—Spot, 2s. 7d. per lb.; 100% d/d buyer's works.

NAPHTHIONIC ACID.—1s. 10d. per lb.

β-NAPHTHOL —£97 per ton; flake, £94 8s. per ton.

α-NAPHTHYLAMINE.—Lumps, 1s. 1d. per lb.

β-NAPHTHYLAMINE.—Spot, 3s. per lb.; d/d buyer's works.

NEVILLE AND WINTHER'S ACID.—Spot, 3s. 3½d. per lb. 100%.

o-NITRANILINE.—4s. 3½d per lb.

m-NITRANILINE.—Spot, 2s. 10d. per lb. d/d buyer's works.

p-NITRANILINE.—Spot, 1s. 10d. to 1s. 11d. per lb. d/d buyer's works.

NITROBENZENE.—Spot, 4½d. to 5d. per lb., in 90-gal. drums, drums extra. 1-ton lots d/d buyer's works.

NITRONAPHTHALENE.—9½d. per lb.; P.G., 1s. 0½d. per lb.

SODIUM NAPHTHIONATE.—Spot, 1s. 11d. per lb.; 100% d/d buyer's works.

SULPHANILIC ACID.—Spot, 8½d. per lb. 100%, d/d buyer's works

o-TOLUIDINE.—10½d. per lb., in 8/10 cwt. drums, drums extra.

p-TOLUIDINE.—1s. 10½d. per lb., in casks.

m-XYLIDINE ACETATE.—4s. 3d. per lb., 100%.

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

P. AND E. J., LTD., Derby, colour and paint manufacturers. (M., 1/4/39.) March 20, £400 mortgage, to Mrs. J. Smith, Derby, and another; charged on 6 Hill View Estate, Deganwy Road, Llanrhos. *£400. Sept. 14, 1938.

WALTER PRESTON, LTD., Leeds, manufacturing chemists. (M., 1/4/39.) March 16, mortgage to Midland Bank, Ltd., securing all moneys due or to become due to the Bank; charged on 12 and 12a Sydenham Street, Holbeck, Leeds, etc. *Nil. Jan. 11, 1939.

Satisfactions

A. B. METAL PRODUCTS, LTD., London, N.W. (M.S., 1/4/39.) Satisfaction March 15, of debenture registered May 14, 1937.

STEWARTS AND LLOYDS, LTD. (incorporated in Scotland). (M.S., 1/4/39.) Satisfaction March 20, of debenture stock registered February 8, 1934, to the extent of £14,100.

County Court Judgments

KAULVERS (H.) MANUFACTURING CO. (firm), 1 Lavers Road, N.16. (C.C., 1/4/39.) Manufacturing chemists. £14 6s. 10d. Jan. 5.

Declaration of Solvency Filed

OLIVER WILKINS AND CO., LTD., London, S.W. (D.S.F., 1/4/39.) Paint manufacturers, etc. Mar. 17.

Forthcoming Events

London.

April 3.—Society of Chemical Industry. Burlington House, Piccadilly, W.1. 8 p.m. Members' meeting. Original papers.

April 4.—Royal Institution. 21 Albemarle Street, W.1. 5.15 p.m. W. L. Bragg, "The Chemistry of the Solid State."

April 5.—Institute of the Plastics Industry. Caxton Hall, Westminster, S.W.1. 7.30 p.m. Annual Section Meeting.

Society of Public Analysts. Burlington House, Piccadilly, W.1. 8 p.m. Meeting for reading of original papers.

Birmingham.

April 4.—Electrodepositors' Technical Society. James Watt Memorial Institute, Great Charles Street. 7.30 p.m. E. Downs, "Electrolytic Silver Refining."

Derby.

April 4.—British Association of Chemists. Notts and Derby Section Annual Meeting. St. James's Restaurant, Derby.

Liverpool.

April 6.—British Association of Chemists. Liverpool. Section Annual Meeting. Exchange Hotel. 7.30 p.m.

Newcastle.

April 5.—Society of Chemical Industry. H. S. Priestly, "Detergents, Manufacture and Use."

Chemical Trade Inquiries

The following trade inquiries are abstracted from the "Board of Trade Journal." Names and addresses may be obtained from the Department of Overseas Trade (Development and Intelligence), 35 Old Queen Street, London, S.W.1 (quote reference number).

Belgium.—A consulting engineer established at Brussels wishes to obtain the representation of United Kingdom manufacturers of industrial furnaces, chemical plant for Belgium. (Ref. No. 243.)

South Africa.—His Majesty's Trade Commissioner at Johannesburg reports that the Johannesburg City Council, Stores Department, is calling for tenders (Contract No. 227) for the supply and delivery as and when required during the twelve months from July 1, 1939, of quantities of disinfecting fluid in drums containing 5 Imperial gallons each. Tenders, endorsed "Contract No. 227—Disinfecting Fluid," should be addressed to the Town Clerk, Municipal Offices, Johannesburg, by whom they will be received up to noon on Wednesday, April 26, 1939.

Poland.—A firm in Warsaw wishes to purchase from, and obtain the representation of, United Kingdom manufacturers of the laboratory apparatus and chemical plant and apparatus, etc. (Ref. No. 229.)

Company News

Lewis Berger and Sons, Ltd., have declared an interim on the ordinary shares of 6 per cent., less tax, for the year ending July 31 (same).

Burt, Boulton and Haywood, Ltd., tar distillers, have declared an interim dividend of 2½ per cent. on the ordinary shares, less tax (same).

The British Enka Artificial Silk Co., Ltd., report a loss of £70,204 after debenture interest, depreciation, income tax, etc. A debit balance, increased to £653,537, is carried forward.

Doulton and Co., Ltd., have declared a dividend of 7½ per cent., less tax, on increased capital (7½ per cent., plus 2½ per cent. cash bonus from capital reserve and 25 per cent. capital bonus).

Canning Town Glass Works, Ltd., report a net profit for 1938 of £44,226 (£48,525). A dividend of 7½ per cent. (same) has been declared, and the carry-forward is £10,609 (£10,288). The meeting is on March 31.

Sternol, Ltd., manufacturers of petroleum products, report a net profit for 1938 of £2,231 (£10,327). A dividend of 2 per cent., less tax, has been declared in respect of arrears to September, 1933, on preference ordinary shares. The carry forward is £2,344 (£4,390).

Palestine Potash report for 1938 a net profit of £67,274 (£47,831) after deducting all expenses, but before making provision for depreciation and amortisation. A sum of £42,000 has been allocated to depreciation and amortisation, provision for which, together with £38,736 provided in 1937, amounts to £80,736.

The British Oxygen Co., Ltd., have declared a final dividend on the ordinary stock of 10 per cent., less tax, making 17 per cent. for the year (the same). A profit of £508,059 (£455,481) is reported. It is proposed to allocate £62,160 to general reserve and £50,000 to reserve against buildings, plant and cylinder, and to carry forward £48,007.

Tunnel Portland Cement, Ltd., report profits for the year ended December 31, of £251,420 (£215,640). A final dividend of 12½ per cent. has been declared bringing the year's total on the "A" and "B" shares to 22½ per cent. Tunnel Asbestos Cement which is controlled by Tunnel Portland Cement earned £13,134 (£18,786) for the year to November 30. A dividend of 5 per cent. (10 per cent.) has been declared on the ordinary shares, while no dividend is recommended on the deferred shares, compared with 5 per cent.

New Companies Registered

Serven, Ltd. 350,199.—Private company. Capital £500 in 500 ordinary shares of £1 each. To carry on the business of manufacturers of and dealers in pharmaceutical preparations, proprietary articles, chemicals, gases, drugs, medicines, etc. Directors: Frank B. Wilks, Glynclydach Farm, Neath; Anthony R. Hughes.

Smit-Ash, Ltd. 349,450.—Private company. Capital £2,000 in 2,000 shares of £1 each. To carry on the business of manufacturers of and dealers in chemicals, starches and other products, etc. Directors: Wm. Ashworth, 220 Burnley Road, Accrington; Austen D. Smith. Registered office: 9 Cannon Street, Accrington.

Westminster Chemicals, Ltd. 350,573. Private company.—Capital £1,000 in £1 shares. To carry on the business of manufacturers of chemicals and chemical compounds, etc. Directors: Hanns G. Loew, 21 Lancaster Gate Terrace, W.2; David S. Downs. Registered office: 6 Westminster Palace Gardens, S.W.1.

United Pharmacies, Ltd. 349,286.—Private company. Capital of £100 in 100 shares of £1 each. To carry on business as manufacturers of and dealers in all kinds of salts, acids, alkalis, drugs, medicines, medicaments, herbs, etc. Subscribers: Geo. E. Perkins, 10 Chenister Gardens, Kensington, W.8; Arthur I. P. Fish.

V. J. Scampton, Ltd. 349,964.—Private company. Capital £1,000 in 1,000 shares of £1 each. To carry on business as manufacturers of and dealers in chemicals, gases, drugs, medicines, plaster of paris, gypsum, etc. Directors: Victor J. Scampton, 123 Holdenhurst Road Bournemouth; Reginald A. Light. Registered office: 123 Holdenhurst Road, Bournemouth.

Metalovac, Ltd. 350,125.—Private company. Capital £100 in 100 shares of £1 each. Objects: To acquire interests in patents relating to the coating of surfaces of any material *in vacuo* or by any other means, etc. Subscribers: Paul Alexander, "Fernbank," St. Mary's Road, Huyton, near Liverpool; Horace W. Surridge. Registered office: 1 Brunswick Street, Liverpool.

Cornelius Produce Co., Ltd. 348,859.—Private company. Capital £2,000 in 2,000 shares of £1 each. To carry on the business of merchants, manufacturers of and dealers in rosin, wax, turpentine, oils, margarine, fats, greases, chemicals, glues, dyes, gums, etc. Directors: Ernst G. Cornelius, 25b Fitzjohn's Avenue, N.W.3; Leslie A. Strange. Registered office: Ibex House, Minories, E.C.

Overseas Raw and Manufactured Products Ltd. 349,948.—Private company. Capital £3,000 in 3,000 ordinary shares of £1 each. To carry on the business of general merchants, manufacturers of and dealers in food and other products, chemicals, manures, distillers, dye and gas makers, etc. Subscribers: Henry P. Arnholz, 5-6 Great Winchester Street, E.C.; C. H. C. Mabey.